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1970

Water Resources Data for Minnesota

Part 1. Surface Water Records

Part 2. Water Quality Records

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Prepared in cooperation with the Minn[illegible]epartment of Conservation, Division of Waters, Soils and Mine[illegible]esota Department of Highways; and with other State, m[illegible]agencies

CALENDAR FOR WATER YEAR 1970

OCTOBER 1969

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

NOVEMBER 1969

S	M	T	W	T	F	S
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30						

DECEMBER 1969

S	M	T	W	T	F	S
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28	29	30	31			

JANUARY 1970

S	M	T	W	T	F	S
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4	5	6	7	8	9	10
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FEBRUARY 1970

S	M	T	W	T	F	S
1	2	3	4	5	6	7
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MARCH 1970

S	M	T	W	T	F	S
1	2	3	4	5	6	7
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29	30	31				

APRIL 1970

S	M	T	W	T	F	S
			1	2	3	4
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MAY 1970

S	M	T	W	T	F	S
					1	2
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17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

JUNE 1970

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
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28	29	30				

JULY 1970

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
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19	20	21	22	23	24	25
26	27	28	29	30	31	

AUGUST 1970

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

SEPTEMBER 1970

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

1970

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Prepared in cooperation with the Minnesota Department of Conservation, Division of Waters, Soils and Minerals; the Minnesota Department of Highways; and with other State, municipal, and Federal agencies

Prepared in cooperation with

Minnesota Department of Conservation, Division of
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City of Rochester
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Bureau of Sport Fisheries and Wildlife

Copies of this report may be obtained from
District Chief, Water Resources Division
U.S. Geological Survey
1033 Post Office Building
St. Paul, Minnesota 55101

1972

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WATER RESOURCES DATA FOR MINNESOTA, 1970

Part 1. Surface-Water Records
Part 2. Water-Quality Records

INTRODUCTION

Water resources data for the 1970 water year for Minnesota including records of streamflow or reservoir storage at gaging stations, partial-record stations, and miscellaneous sites, and records of water-quality data on the chemical and physical characteristics of surface- and ground-water, are given in this report. Records for a few pertinent gaging and water-quality stations and selected data on chemical quality of ground water in bordering States are also included. The records were collected and computed by the Water Resources Division of the U. S. Geological Survey under the direction of Charles R. Collier, district chief. Hydrologic data in this report are collected by the U. S. Geological Survey and cooperating State and Federal agencies in Minnesota. The data are part of the National Water Data System.

Through September 30, 1960, the records of discharge and stage of streams and contents and stage of lakes or reservoirs were published in an annual series of U. S. Geological Survey water-supply papers entitled, "Surface Water Supply of the United States."

Beginning with the 1961 water year, streamflow records and related data have been released by the Geological Survey in annual reports on a State-boundary basis. Distribution of these reports is limited; they are designed primarily for rapid release of data shortly after the end of the water year to meet local needs. The streamflow records for 1961-65 are also published in a Geological Survey water-supply paper series entitled, "Surface Water Supply of the United States 1961-65." There will be a similar series of water-supply papers for the water years 1966-70.

The Geological Survey has published records of chemical quality, suspended sediment, and water temperatures since 1941 in an annual series of water-supply papers entitled, "Quality of Surface Waters of the United States." Beginning with the 1964 water year, water-quality records also have been released on a State-boundary basis in conjunction with streamflow records or in a separate volume.

COOPERATION

The U. S. Geological Survey and organizations of the State of Minnesota have had cooperative agreements for the systematic collection of streamflow records since 1909, and for water-quality records since 1952. Organizations that supplied data are acknowledged in station

descriptions. Organizations that assisted in collecting data through cooperative agreement with the Survey are:

Minnesota Department of Conservation, Division of Waters, Soils and Minerals, Eugene R. Gere, director.

Minnesota Department of Highway, N. T. Waldor, commissioner.

Assistance in the form of funds or services was given by the Corps of Engineers, U. S. Army, in collecting records for 30 gaging stations published in this report.

Several gaging stations in the Hudson Bay and St. Lawrence River basins were maintained by funds appropriated to the United States Department of State.

On waters adjacent to the international boundary, certain gaging stations are maintained by the United States (or Canada) under agreement with Canada (or the United States), and the records are obtained and compiled in a manner equally acceptable in both countries. These stations are designated herein as "International gaging stations."

Some records for the Red River of the North, which border the State on the west, were obtained at the request of other Federal agencies as a part of the program of the U. S. Department of the Interior for development of the Missouri River basin.

DEFINITION OF TERMS

Definition of terms related to streamflow, water-quality, and other hydrologic data, as used in this report, are defined as follows:

Acre-foot (AC-FT, acre-ft) is the quantity of water required to cover 1 acre to a depth of 1 foot and is equivalent to 43,560 cubic feet or 325,851 gallons.

Biochemical oxygen demand (BOD) is the amount of oxygen required by bacteria while stabilizing decomposable organic matter under aerobic conditions.

Chemical oxygen demand (COD) indicates the quantity of oxidizable compounds present in a water and will vary with water compositions, concentration of reagent, temperature, period of contact, and other factors.

Coliform organisms are a group of bacteria used as an indicator of the sanitary quality of the water. The number of coliform colonies per 100 milliliters is determined by the immediate or delayed incubation membrane filter method.

Contents is the volume of water in a reservoir or lake. Unless otherwise indicated, volume is computed on the basis of a level pool and does not include bank storage.

Control designates a feature downstream from the gage that determines the stage-discharge relation at the gage. This feature may be a natural constriction of the channel, an artificial structure, or a uniform cross section over a long reach of the channel.

Cfs-day is the volume of water represented by a flow of 1 cubic foot per second for 24 hours. It is equivalent to 86,400 cubic feet, 1.9835 acre-feet, or 646,317 gallons, and represents a runoff of 0.0372 inch from 1 square mile.

Cubic feet per second per square mile (CFSM) is the average number of cubic feet of water flowing per second from each square mile of area drained, assuming that the runoff is distributed uniformly in time and area.

Cubic foot per second (cfs) is the rate of discharge representing a volume of 1 cubic foot passing a given point during 1 second and is equivalent to 7.48 gallons per second or 448.8 gallons per minute.

Discharge is the volume of water (or more broadly, total fluids), that passes a given point within a given period of time.

Mean discharge is the arithmetic average of individual daily mean discharges during a specific period.

Instantaneous discharge is the discharge at a particular instant of time. If this discharge is reported instead of the daily mean, the heading of the discharge column in the tables is "Discharge (cfs)."

Drainage area of a stream at a specified location is that area measured in a horizontal plane, enclosed by a topographic divide from which direct surface runoff from precipitation normally drains by gravity into the stream above the specified point. Figures of drainage area given herein include all closed basins, or noncontributing areas, within the area unless otherwise noted.

Gage height (G.H.) is the water-surface elevation referred to some arbitrary gage datum. Gage height is often used interchangeably with the general term "stage," although gage height is more appropriate when used with a reading on a gage.

Gaging station is a particular site on a stream, canal, lake, or reservoir where systematic observations of gage height or discharge are obtained. When used in connection with a discharge record, the term is applied only to those gaging stations where a continuous record of discharge is obtained.

Hardness of water is a physical-chemical characteristic attributable to the presence of alkaline earths (principally calcium and magnesium) and is expressed as equivalent calcium carbonate ($CaCO_3$).

Methylene blue active substance (MBAS) is a measure of apparent detergents. This determination depends on the formation of a blue color when methylene blue dye reacts with synthetic detergent compounds.

Micrograms per liter (ug/l, UG/L) is a more precise unit for expressing the concentration of chemical constituents in solution. One thousand micrograms per liter is equivalent to one milligram per liter. See below.

Milligrams per liter (mg/l, MG/L) is a unit for expressing the concentration of chemical constituents in solution. Milligrams per liter represents the weight of solute per unit volume of water. Milligrams or micrograms per liter may be converted to milliequivalents (one thousandth of a gram-equivalent weight of a constituent) per liter by multiplying by the factors in table 1, page 5. Concentration of suspended sediment expressed in milligrams per liter is based on the weight of sediment in a liter of water-sediment mixture. Sediment concentrations that are expressed in parts per million may be converted to milligrams per liter by using the factors in table 2, page 5.

Partial-record station is a particular site where limited streamflow or water-quality data are collected systematically over a period of years for use in hydrologic analyses.

Particle size is the diameter, in millimeters (mm), of suspended sediment or bed material determined by sieve and sedimentation methods.

Particle-size classification, used in this report, agrees closely with recommendations made by the American Geophysical Union Subcommittee on Sediment Terminology (Lane and others, 1947, p. 937). The classification is as follows:

Clay:	Smaller than 0.004 mm.
Silt:	Between 0.004 and 0.062 mm.
Sand:	Between 0.0062 and 2.0 mm.
Gravel:	Between 2.0 and 64.0 mm.

The particle-size distributions given in this report are not necessarily representative of the particle sizes of sediment in transport in the natural stream. Most of the organic matter is removed, and the sample is subjected to mechanical and chemical dispersion before analysis of the silt and clay.

Plankton is the floating (or weakly swimming) animal or plant life in a body of water consisting chiefly of minute plants (as diatoms and

Table 1.--Factors for conversion of chemical constituents in milligrams or micrograms per liter to milliequivalents per liter

Ion	Multiply by	Ion	Multiply by
Aluminum (Al^{+3})*....	0.11119	Iodide (I^{-1}).....	0.00788
Ammonia as NH_4^{+1}....	.05544	Iron (Fe^{+3})*.....	.05372
Barium (Ba^{+2}).....	.01456	Lead (Pb^{+2})*.....	.00965
Bicarbonate (HCO_3^{-1})	.01639	Lithium (Li^{+1})*...	.14411
Bromide (Br^{-1}).....	.01251	Magnesium (Mg^{+2})..	.08226
Calcium (Ca^{+2}).....	.04990	Manganese (Mn^{+2})*.	.03640
Carbonate (CO_3^{-2})...	.03333	Nickel (Ni^{+2})*....	.03406
Chloride (Cl^{-1})	.02821	Nitrate (NO_3^{-1})...	.01613
Chromium (Cr^{+6})*....	.11539	Nitrite (NO_2^{-1})...	.02174
Cobalt (Co^{+2})*.....	.03394	Phosphate (PO_4^{-3}).	.03159
Copper (Cu^{+2})*.....	.03148	Potassium (K^{+1})...	.02557
Cyanide (CN^{-1})*.....	.03844	Sodium (Na^{+1}).....	.04350
Fluoride (F^{-1}).....	.05264	Strontium (Sr^{+2})*.	.02283
Hydrogen (H^{+1}).....	.99209	Sulfate (SO_4^{-2})...	.02082
Hydroxide (OH^{-1})....	.05880	Zinc (Zn^{+2})*.....	.03060

*Constituent reported in micrograms per liter; multiply by factor and results by 1,000.

Table 2.--Factors for conversion of sediment concentrations in parts per million to milligrams per liter*
(All values calculated to three significant figures)

Range of concentration (ppm)	Multiply by	Range of concentration (ppm)	Multiply by
0 - 15,900	1.00	322,000 - 341,000	1.26
16,000 - 46,800	1.02	342,000 - 361,000	1.28
46,900 - 76,500	1.04	362,000 - 380,000	1.30
76,600 - 105,000	1.06	381,000 - 399,000	1.32
106,000 - 133,000	1.08	400,000 - 416,000	1.34
134,000 - 159,000	1.10	417,000 - 434,000	1.36
160,000 - 185,000	1.12	435,000 - 451,000	1.38
186,000 - 210,000	1.14	452,000 - 467,000	1.40
211,000 - 233,000	1.16	468,000 - 483,000	1.42
234,000 - 256,000	1.18	484,000 - 498,000	1.44
257,000 - 279,000	1.20	499,000 - 514,000	1.46
280,000 - 300,000	1.22	515,000 - 528,000	1.48
301,000 - 321,000	1.24	529,000 - 542,000	1.50

*Based on water density of 1.000 g/ml and sediment density of 2.65 g/cc.

blue-green algae) and of minute animals (as protozoan, entomostracans, and various larvae).

Runoff in inches (IN.) shows the depth to which the drainage area would be covered if all the runoff for a given time period were uniformly distributed on it.

Sediment is solid material that originates mostly from disintegrated rocks and is transported by, suspended in, or deposited from water; it includes chemical and biochemical precipitates and decomposed organic material such as humas. The quantity, characteristics, and cause of the occurrence of sediment in streams are influenced by environmental factors. Some major factors are degree of slope, length of slope, soil characteristics, land usage, and quantity and intensity of precipitation.

Sediment discharge is the rate at which dry weight of sediment passes a section of a stream or is the quantity of sediment, as measured by dry weight, or by volume, that is discharged in a given time.

Sodium adsorption ratio (SAR) is the expression of relative activity of sodium ions in exchange reactions with soil and is an index of sodium or alkali hazard to the soil. This ratio should be known especially for water used for irrigating farmland.

Solute is any substance derived from the atmosphere, vegetation, soil, or rocks that is dissolved in water.

Specific conductance is a measure of the ability of a water to conduct an electrical current and is expressed in micromhos per centimeter at 25°C. Because the specific conductance is related to the number and specific chemical types of ions in solution, it can be used for approximating the dissolved-solids content in the water. Commonly, the amount of dissolved solids (in milligrams per liter) is about 65 percent of the specific conductance (in micromhos). This relation is not constant from stream to stream or from well to well, and it may even vary in the same source with changes in the composition of the water.

Stage-discharge relation is the relation between gage height and the amount of water flowing in a channel, expressed as volume per unit of time.

Suspended sediment is the sediment that at any given time is maintained in suspension by the upward components of turbulent currents or that exists in suspension as a colloid.

Thermograph is a thermometer that continuously and automatically records, on a chart, the water temperature of a stream. "Temperature recorder" is the term used to indicate the presence of a thermograph or a digital mechanism that automatically records water temperatures on paper tape.

Time-weighted average is computed by multiplying the number of days in the sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the total number of days. A time-weighted average represents the composition of water that would be contained in a vessel or reservoir that had received equal quantities of water from the stream each day for the water year.

Tons per acre-foot indicates the dry weight of dissolved solids in 1 acre-foot of water. It is computed by multiplying the concentration of milligrams per liter by 0.00136.

Tons per day is the quantity of a substance in solution or suspension that passes a stream section during the 24-hour period.

WRD is used as an abbreviation for "Water-Resources Data" in the summary REVISIONS paragraph to refer to previously published State annual basic-data reports.

WSP is used as an abbreviation for "Water-Supply Paper" in references to previously published reports.

Weighted average is used in this report to indicate discharge-weighted average. It is computed by multiplying the discharge for a sampling period by the concentrations of individual constituents for the corresponding period and dividing the sum of the products by the sum of the discharges. A discharge-weighted average approximates the composition of water that would be found in a reservoir containing all the water passing a given location during the water year after thorough mixing in the reservoir.

SPECIAL NETWORKS AND PROGRAMS

Hydrologic bench-mark station is one that provides hydrologic data for a basin in which the hydrologic regimen will likely be governed solely by natural conditions. Data collected at a bench-mark station may be used to separate effects of natural from man-made changes in other basins which have been developed and in which the physiography, climate, and geology are similar to those in the undeveloped bench-mark basin.

DOWNSTREAM ORDER AND STATION NUMBERS

Records are listed in a downstream direction along the main stream, and stations on tributaries are listed between stations on the main stream in the order in which those tributaries enter the main stream. Stations on tributaries entering above all mainstream stations are listed before the first mainstream station. Stations on tributaries to tributaries are listed in a similar manner. In

the lists of gaging stations and water-quality stations in the front of this report the rank of tributaries is indicated by indention, each indention representing one rank.

As an added means of identification, each gaging station, partial-record station, and water-quality station have been assigned a station number. These are in the same downstream order used in this report. In assigning station numbers, no distinction is made between partial-record stations and continuous-record gaging stations; therefore, the station number for a partial-record station indicates downstream order position in a list made up of both types of stations. Water-quality stations located at or near gaging stations or partial-record stations have the same number as the gaging or partial-record station. Gaps are left in the numbers to allow for new stations that may be established; hence, the numbers are not consecutive. The complete 8-digit number for each station, such as 05061500, includes the part number "05" and a 6-digit number. This number appears just to the left of the station name. In this report, the records are listed in downstream order by parts. All records for a drainage basin encompassing more than one State could be arranged in downstream order by assembling pages from the various State reports by station number to include all records in the basin.

WELL NUMBERS

The well numbering system of the U. S. Geological Survey is based on the grid system of latitude and longitude. The first 6 digits denote the degrees, minutes, and seconds of latitude followed by a letter denoting north or south. Seven digits following the letter denote degrees, minutes, and seconds of longitude. The last digit is a sequential number for wells within a 1-second grid. The system provides the geographic location of the well and a unique number for each well.

PART 1. SURFACE WATER RECORDS

Collection and computation of data

The base data collected at gaging stations consists of records of stage and measurements of discharge of streams or canals, and stage, surface area, and contents of lakes or reservoirs. In addition, observations of factors affecting the stage-discharge relation or the stage-capacity relation, weather records, and other information are used to supplement base data in determining the daily flow or volume of water in storage. Records of stage are obtained from a water-stage recorder that gives a continuous graph of the fluctuations (for digital recorders, a tape punched at 15-, 30-, or 60-minute intervals) or from direct readings on a nonrecording gage. Measurements of discharge are made with a current meter, using the general methods adopted by the Geological Survey on the basis of experience in stream gaging since 1888. These methods are described in standard textbooks on the measurement of stream discharge. (See also SELECTED REFERENCES). Surface areas of lakes or reservoirs are determined from instrument sur-

veys using standard methods. The configuration of the reservoir bottom is determined by sounding at many points.

For a stream-gaging station, rating tables giving the discharge for any stage are prepared from stage-discharge relation curves defined by discharge measurements. If extensions to the rating curves are necessary to define the extremes of discharge, they are made on the basis of indirect measurements of peak discharge (such as slope-area or contracted-opening measurements, computation of flow over dams or weirs), velocity-area studies, and logarithmic plotting. The application of the daily mean gage height to the rating table gives the daily mean discharge, from which the monthly and the yearly mean discharge are computed. If the stage-discharge relation is subject to change because of frequent or continual change in the physical features that form the control, the daily mean discharge is determined by the shifting-control method, in which correction factors based on individual discharge measurements and notes by engineers and observers are used in applying the gage heights to the rating tables. If the stage-discharge relation for a station is temporarily changed by the presence of aquatic growth or debris on the control, the daily mean discharge is computed by what is basically the shifting-control method.

At some stream-gaging stations the stage-discharge relation is affected by backwater from reservoirs, tributary streams, or other sources. This necessitates the use of the slope method in which the slope or fall in a reach of the stream is a factor in determining discharge. Information required for determining the slope or fall is obtained by means of an auxiliary gage set at some distance from the base gage. At some stations the stage-discharge relation is affected by changing stage; at these stations the rate of change in stage is used as a factor in determining discharge.

At some stream-gaging stations the stage-discharge relation is affected by ice in the winter, and it becomes impossible to compute the discharge in the usual manner. Discharge for periods of ice effect is computed on the basis of the gage-height record and occasional winter discharge measurements, consideration being given to the available information on temperature and precipitation, notes by gage observers and hydrologists, and comparable records of discharge for other stations in the same or nearby basins.

For a lake or reservoir station, capacity tables giving the contents for any stage are prepared from stage-area relation curves defined by surveys. Discharge over spillways is computed from a stage-discharge relation curve defined by discharge measurements. The application of the stage to the capacity table gives the contents from which the daily, monthly, or yearly change in contents are computed.

If the stage-capacity curve is subject to changes because of deposition of sediment in the reservoir, periodic resurveys of the reservoir are necessary to define new stage-capacity curves. During the period between reservoir surveys the computed contents may be increasingly in error due to the gradual accumulation of sediment.

For some gaging stations there are periods when no gage-height record is obtained or the recorded gage height is so faulty that it cannot be used to compute daily discharge or contents. This happens when the recorder stops or otherwise fails to operate properly, intakes are plugged, the float is frozen in the well, or for various other reasons. For such periods the daily discharges are estimated on the basis of recorded range in stage, adjoining good record, discharge measurements, weather records, and comparison with other station records from the same or nearby basins. Likewise daily contents may be estimated on the basis of operator's log, adjoining good record, inflow-outflow studies, and other information.

The data in this report generally comprise a description of the station and tabulations of basic data. For gaging stations on streams or canals a table showing the daily discharge and monthly and yearly discharge is given. For gaging stations on lakes and reservoirs a monthly summary table of stage and contents or table showing the daily contents is given. Tables of daily mean gage heights are included for some streamflow stations and for some reservoir stations. Records are published for the water year, which begins on October 1 and ends on September 30. A calendar for the 1970 water year is shown on the reverse side of the front cover to facilitate finding the day of the week for any date.

The description of the gaging stations gives the location, drainage area, period of record, type and history of gages, average discharge, extremes of discharge or contents, and general remarks. The location of the gaging station and the drainage area are obtained from the most accurate maps available. River mileage, given under "LOCATION" for some stations, is that determined and used by the Corps of Engineers or other agencies. Periods for which there are published records for the present station or for stations generally equivalent to the present one are given under "PERIOD OF RECORD." The type of gage currently in use, the datum of the present gage above mean sea level, and a condensed history of the types, locations, and datum of previous gages used during the period of record are given under "GAGE." In references to datum of gage, the phrase "mean sea level" denotes "Sea Level Datum of 1929" as used by the Topographic Division of the Geological Survey unless otherwise qualified. The average discharge for the number of years indicated is given under "AVERAGE DISCHARGE:" it is not given for stations having fewer than 5 complete years of record or for stations where changes in water development during the period of record cause

the figure to have a little significance. In addition, the median of yearly mean discharges is given for stream-gaging stations having 10 or more complete years of record if the median differs from the average by more than 10 percent. The maximum discharge (or contents) and the maximum gage height, the minimum discharge if there is little or no regulation (or minimum contents) and the minimum gage height if it is significant are given under "EXTREMES." The minimum daily discharge is given if there is extensive regulation (also the minimum discharge and gage height if they are abnormally low). In the first paragraph headed "Current year," the data given are for the complete current water year unless otherwise specified. In the second paragraph under "EXTREMES" headed "Period of record:" the data given are for the period of record given in PERIOD OF RECORD paragraph. Reliable information concerning major floods that occurred outside the period of record is given in the third or last paragraph under "EXTREMES." Unless otherwise qualified, the maximum discharge (or contents) corresponds to the crest stage obtained by use of a water-stage recorder (graphic or digital), a crest-stage gage, or a nonrecording gage read at the time of the crest. If the maximum gage height did not occur at the same time as the maximum discharge (or contents), it is given separately. Information pertaining to the accuracy of the discharge records, to conditions that affect the natural flow at the gaging station, and availability of Water Quality records, is given under "REMARKS:" for reservoir stations information on the dam forming the reservoir, the capacity, outlet works and spillway, and purpose and use of the reservoir, is also under "REMARKS."

Previously published records of some stations have been found to be in error on the basis of data or information later obtained. Revisions of such records are usually published along with the current records in one of the annual or compilation reports. In order to make it easier to find such revised records, a paragraph headed "REVISIONS (WATER YEARS)" has been added to the description of all stations for which revised records have been published. Listed therein are all the reports in which revisions have been published, each followed by the water years for which figures are revised in that report. In listing the water years only one number is given; for instance, 1965 stands for the water year October 1, 1964, to September 30, 1965. If no daily, monthly, or annual figures of discharge were revised, that fact is brought out by notations after the year dates as follows: "(M)" means that only the instantaneous maximum discharge was revised; "(m)" that only the instantaneous minimum was revised; and "(P)" that only peak discharges were revised. If the drainage area has been revised, the report in which the revised figure was first published is given. It should be noted that for all stations for which cubic feet per second per square mile and runoff in inches are published, a revision of the drainage area necessitates corresponding revision of all figures based on the drainage area. Revised figures of cubic feet per second per square mile and runoff in inches resulting from a revision of the drainage area only are usually not published in the annual series of reports.

Skeleton rating tables are published for stream-gaging stations where they serve a useful purpose and the dates of applicability can be easily identified.

Skeleton capacity tables are published for all reservoirs for which records of contents are published on a daily basis.

The daily table for stream-gaging stations gives the discharge corresponding to the daily mean gage height unless there are large or rapid changes in the discharge during a day. For days having large or rapid changes, discharge for the day is computed by averaging the mean discharge for several parts of a day. For digital recorders, the daily mean discharge is always the average of the discharges at each punched reading. For stations equipped with nonrecording gages, the daily discharge corresponds to once-daily readings of the gage or to the mean of twice-daily reading; but for periods of rapidly changing stage the discharge is determined from a gage-height graph based on gage readings.

The daily tables for reservoir stations give the contents corresponding to the water-surface elevation at a given time, usually at 2400 each day. For some reservoirs the elevation at a given time is given in the daily table.

The monthly summary is given below the daily table. For stream-gaging stations the line headed "TOTAL" gives the sum of the daily figures. The line headed "MEAN" gives the average flow in cubic feet per second during the month. The lines headed "MAX." and "MIN." give the maximum and minimum daily discharges, respectively, for the month. Discharge for the month also may be expressed in cubic feet per second per square mile (line headed "CFSM."), or in ("AC-FT"). Figures for cubic feet per second per square mile and runoff in inches are omitted if there is extensive regulation of diversion, if the drainage area includes large noncontributing areas, or if the average rainfall on the drainage basin is usually less than 20 inches.

For reservoir stations, the monthly summary gives the elevation (or gage height) at the end of the month and the change in contents during the month. If elevation or gage height is given in the daily table, the monthly summary gives the contents at the end of the month, rather than the elevation or gage height. For some reservoirs a tabulation of monthly evaporation from the water surface also is included.

In the yearly summary below the monthly summary, the figures following MAX are the maximum daily discharges for the calendar and water years; likewise, those following MIN are minimum daily discharges.

For reservoir stations the yearly summary gives the change in contents for the calendar year and for the water year. For some reservoirs the yearly evaporation also is included.

Peak discharges and their times of occurrence and corresponding gage heights for many stations are listed below the yearly summary. All independent peaks above the selected base are given. The base discharge, which is given in parentheses, is selected so that an average of about three peaks a year can be presented. Peak discharges are not published for any canals, ditches, drains, or for any stream for which the peaks are subject to substantial control by man. Time of day is expressed in 24-hour local standard time; for example, 12:30 a.m. is 0030, 1:30 p.m. is 1330.

In a general footnote, introduced by the word "NOTE," certain periods are indicated for which the discharge is computed or estimated by special methods because of no gage-height record, backwater from various sources, or other unusual conditions. Periods of no gage-height record are indicated if the period is continuous for a month or more or includes the maximum discharge for the year. Periods of backwater from an unusual source, of indefinite stage-discharge relation, or of any other unusual condition at the gage are indicated only if they are a month or more in length and the accuracy of the records is affected. Days on which the stage-discharge relation is affected by ice are not indicated. The methods used in computing discharge for various unusual conditions have been explained in preceding paragraphs. Footnotes to reservoir tables may be used to explain the use of new capacity tables or for other special conditions.

Accuracy of Data

The accuracy of discharge data depends primarily on (1) the stability of the stage-discharge relation, or if the control is unstable, the frequency of discharge measurements, and (2) the accuracy of observations of stage, measurements of discharge, and interpretation of records.

The station description under "REMARKS" states the degree of accuracy of the records. "Excellent" means that about 95 percent of the daily discharges is within 5 percent; "good" within 10 percent; and "fair" within 15 percent. "Poor" means that daily discharges have less than "fair" accuracy.

Figures of daily mean discharge in this report are shown to the nearest hundredth of a cubic foot per second for discharges of less than 1 cfs; to tenths between 1.0 and 10 cfs; to whole numbers between 10 and 1,000 cfs; and to 3 significant figures above 1,000 cfs. The number of significant figures used is based solely on the magnitude of the figure. The same rounding rules apply to discharge figures listed for partial-record stations and miscellaneous sites.

Discharge at many stations, as indicated by the monthly mean, may not reflect natural runoff due to the effects of diversion, consumptive use, regulation, evaporation or other factors. For these stations, discharge in cubic feet per second per square mile and runoff in inches are not published unless satisfactory adjustments can be made for such effects.

Evaporation from a reservoir is not included in the adjustments for changes in reservoir contents, unless it is so stated. Even at those stations where adjustments are made, large errors in computed runoff may occur if adjustments or unadjusted losses (consumptive use, evaporation, seepage, etc.) are large in comparison with the observed discharge.

Publications

Each volume of the 1960 series of U.S. Geological Survey water-supply papers entitled "Surface Water Supply of the United States" contains a listing of the numbers of all water-supply papers in which records of surface-water data were published for the area covered by the individual volumes. Each volume also contains a list of water-supply papers that gives detailed information on major floods for the area. A new series of water-supply papers containing surface-water records for the 5-year period October 1, 1960, to September 30, 1965, also will include lists of annual and special reports published as water-supply papers.

Records through September 1950 for the area covered by this report have been compiled and published in Water-Supply Papers 1307 (4), 1308 (5), and 1309 (6A); records for October 1950 to September 1960 have been compiled and published in Water-Supply Papers 1727 (4), 1728 (5), and 1730 (6B). These reports contain summaries of monthly and annual discharge and monthend storage for all previously published records, as well as some records not contained in the annual series of water-supply papers. All records were re-examined and revised where warranted. Estimates of discharge were made to fill short gaps whenever practical. The yearly summary table for each gaging station lists the numbers of the water-supply papers in which daily records were published for that station.

Special reports on major floods or droughts or of other hydrologic studies for the area have been issued in publications other than water-supply papers. Information relative to these reports may be obtained from the district office.

Other Data Available

Data collected at partial-record stations and at miscellaneous sites are given in three tables at the end of the surface-water records in this report. The first is a table of discharge measurements at low-flow partial-record stations, the second is a table of annual maximum stage and discharge at crest-stage stations, and the third is a table of discharge measurements at miscellaneous sites.

More detailed information, than that published for most of the gaging stations, such as discharge measurements, gage-height record, and rating tables, is on file in the district office. Many gaging-stations records in Minnesota have been analyzed through 1968 to give several statistical summaries: (1) the number of days in each year that the daily discharge was between selected limits (duration

tables); (2) the lowest mean discharge for selected numbers of consecutive days in each year; and (3) the highest mean discharge for selected numbers of consecutive days in each year.

PART 2. WATER QUALITY RECORDS

Collection and examination of data

Water samples for analyses usually are collected at or near gaging stations. The discharge records at these stations are used in conjunction with the computations of the chemical constituents and sediment loads in this report.

Descriptive statements are given for water-quality stations located at or near streamflow stations. Given are location, drainage area, periods of record for the various water-quality data, extremes of pertinent data, and general remarks, in a format similar to that used for streamflow gaging stations. For ground-water stations, no descriptive statements are given; however, the well number, depth of well, date of sampling, and other pertinent data are given in the table containing the chemical analyses of the ground water.

Data on the quality of surface water were collected from designated sampling sites (map on page 222) at predetermined intervals such as once daily, weekly, monthly or less frequently. Whereas at some sites it was necessary to continuously record data on a punched paper tape at 15-, 30-, or 60-minute intervals. Data on quality of ground water were collected at 65 wells throughout the State.

Water-quality information is presented for chemical quality, biological, microbiological, water temperature, and fluvial sediment. Chemical quality includes concentrations of individual dissolved constituents and certain properties or characteristics such as hardness, sodium adsorption ratio, specific conductance, and pH. The biological information includes qualitative and quantitative analyses of plankton, bottom organisms, and particulate inorganic and amorphous matter present. Microbiological information includes quantitative identification of certain bacteriological indicator organisms. Water-temperature data represent once-daily observations except for stations where a continuous temperature recorder furnished information from daily minimums and maximums are obtained. Fluvial-sediment information is given for suspended-sediment discharges and concentrations and for particle-size distribution of suspended sediment and bed material.

Prior to the 1968 water year, data for chemical constituents and concentration of suspended sediment were reported in parts per million (ppm) and water temperatures were reported in degrees Fahrenheit (°F). In October 1967 the U. S. Geological Survey began to use the metric system; data for chemical constituents and concentrations of suspended

sediment are now reported in milligrams per liter (mg/l) and water temperatures are given in degrees Celsius (centigrade, °C). In waters with a density of 1.000 g/ml (grams per milliliter), parts per million and milligrams per liter can be considered equal. In waters with a density greater than 1.000 g/ml, values in parts per million should be multiplied by the density to convert to milligrams per liter. To convert temperatures in degrees Fahrenheit to degrees Celsius, see table 3 below.

In October 1968, the Geological Survey began reporting many of the chemical constituents as well as the minor elements in micrograms per liter instead of milligrams per liter. (See "Definition of Terms," p. 4.)

Table 3.--Degrees Fahrenheit (°F) to degrees Celsius (°C)* Temperature reported to nearest 0.5°C)

°F	°C	°F	°C	°F	°C	°F	°C	°F	°C
32	0.0	50	10.0	68	20.0	86	30.0	104	40.0
33	.5	51	10.5	69	20.5	87	30.5	105	40.5
34	1.0	52	11.0	70	21.0	88	31.0	106	41.0
35	1.5	53	11.5	71	21.5	89	31.5	107	41.5
36	2.0	54	12.0	72	22.0	90	32.0	108	42.0
37	3.0	55	13.0	73	23.0	91	33.0	109	43.0
38	3.5	56	13.5	74	23.5	92	33.5	110	43.5
39	4.0	57	14.0	75	24.0	93	34.0	111	44.0
40	4.5	58	14.5	76	24.5	94	34.5	112	44.5
41	5.0	59	15.0	77	25.0	95	35.0	113	45.0
42	5.5	60	15.5	78	25.5	96	35.5	114	45.5
43	6.0	61	16.0	79	26.0	97	36.0	115	46.0
44	6.5	62	16.5	80	26.5	98	36.5	116	46.5
45	7.0	63	17.0	81	27.0	99	37.0	117	47.0
46	8.0	64	18.0	82	28.0	100	38.0	118	48.0
47	8.5	65	18.5	83	28.5	101	38.5	119	48.5
48	9.0	66	19.0	84	29.0	102	39.0	120	49.0
49	9.5	67	19.5	85	29.5	103	39.5	121	49.5

*°C = 5/9 (°F - 32) or °F = 9/5 (°C) + 32.

Solutes

The methods of collecting and analyzing water samples for determining the kinds and concentrations of solutes are described by Skougstad, Brown, and Fishman (1970). One sample can define adequately the water quality at a given time if the mixture of solutes throughout the stream cross section is homogeneous. However, the concentration of solutes at different locations in the cross section may vary widely with different rates of water discharge, depending on the source of material and the turbulence and mixing of the stream. Some streams must be sampled at several verticals across the channel to determine accurately the solute load.

Ground-water quality does not change significantly during short periods of time; infrequent sampling and analysis of ground water adeaquately define ground-water quality at a given site. Water samples from wells are analyzed individually.

Temperature

Water temperatures are measured at most of the water-quality stations. For daily stations, the water temperatures are taken about the same time each day when sample is collected. Large streams have a small diurnal temperature change while small, shallow streams may have a daily range of several degrees and may follow closely the changes in air temperature. Some streams may be affected by waste-heat discharges.

At stations where continuously recording thermographs are present, the records consist of maximum and minimum temperatures for each day and the monthly averages.

Sediment

Suspended-sediment concentrations are determined from samples collected by using depth-integrating samplers. Samples usually are obtained at several verticals in the cross-section, or a single sample may be obtained at a fixed point and a coefficient applied to determine the mean concentration in the cross sections.

During periods of rapidly changing flow or rapidly changing concentration, samples may have been collected more frequently (twice daily or, in some instances, hourly). The published sediment discharges for days of rapidly changing flow or concentration were computed by the sub-divided day method (time-discharge weighted average). Therefore, for those days when the published sediment discharge value differs from the value computed as the product of discharge times mean concentration times 0.0027, the reader can assume that the sediment discharge for that day was computed by the sub-divided day method. For periods when no samples are collected, daily loads of suspended sediment are estimated on the basis of water discharge, sediment concentrations observed immediately before and after the periods, and suspended-sediment loads for other periods of similar discharge.

At other stations, suspended-sediment samples are collected periodically at many verticals in the stream cross section. Although data collected periodically may represent conditions only at the time of observation, such data are useful in establishing seasonal relations between quality and streamflow in predicting long-term sediment-discharge characteristics of the stream.

In addition to the records of the quantities of suspended sediment, records of periodic measurements of the particle-size distribution of the suspended sediment and bed material are included.

Publications

The annual series of water-supply papers that contain information on quality of surface waters in Minnesota are listed below:

Water year	Parts 1-14	Parts 1-4	Parts 3-4	Parts 5-6	Water year	Parts 1-14	Parts 1-4	Parts 3-4	Parts 5-6
1941	942	---	---	---	1954	---	1350	---	1351
1942	950	---	---	---	1955	---	1400	---	1401
1943	970	---	---	---	1956	---	1450	---	1451
1944	1022	---	---	---	1957	---	1520	---	1521
1945	1030	---	---	---	1958	---	1571	---	1572
1946	1050	---	---	---	1959	---	---	1642	1643
1947	1102	---	---	---	1960	---	---	1742	1743
1948	---	1132	---	1132	1961	---	---	1882	1883
1949	---	1162	---	1162	1962	---	---	1942	1943
1950	---	1186	---	1187	1963	---	---	1948	1949
1951	---	1197	---	1198	1964	---	---	1955	1956
1952	---	1250	---	1251	1965	---	---	1962	1963
1953	---	1290	---	1291	1966	---	---	1992	1993

HYDROLOGIC CONDITIONS

Annual runoff during the 1970 water year was generally near normal. The water year began with greater than normal streamflow throughout the State during October and November. During the winter period and continuing through the spring and early summer, streamflow returned to near normal conditions. During July and August streamflow was generally less than normal.

No significant floods occurred during the year. Heavy snow cover did accumulate during the winter months; however, ideal melting conditions during late March and early April prevented any severe flooding.

SELECTED REFERENCES

American Public Health Association, and others 1965, Standard methods for the examination of water and wastewater, 12th ed.: Am. Public Health Assoc., New York, 769 p.

Brown, Eugene, Skougstad, M. W., and Fishman, M. J., 1970 Methods for collection and analysis of water samples for dissolved minerals and gases: U.S. Geol. Survey Techniques of Water-Resources Inv., book 5, chap. A1, 160 p.

Carter, R. W., and Davidian, Jacob, 1968, General procedures for gaging streams: U.S. Geol. Survey Techniques of Water-Resources Inv., book 3, chap. A6, 13 p.

Colby, B. R., 1963, Fluvial sediments--a summary of source, transportation, deposition, and measurement of sediment discharge: U.S. Geol. Survey Bull. 1181-A, 47 p.

Colby, B. R., and Hembree, C. H., 1955, Computations of total sediment discharge, Niobrara River near Cody, Nebraska: U.S. Geol. Survey Water-Supply Paper 1357, 187 p.

Colby, B. R., and Hubbell, D. W., 1961, Simplified methods for computing total sediment discharge with the modified Einstein procedure: U.S. Geol. Survey Water-Supply Paper 1593, 17 p.

Corbett, D. M., and others, 1943, reprinted 1957, Stream-gaging procedures, a manual describing methods and practices of the Geological Survey: U.S. Geol. Survey Water-Supply Paper 888, 245 p.

Guy, H. P., 1970, Fluvial sediment concepts: U.S. Geol. Survey Techniques of Water-Resources Inv., book 3, chap. C1, 55 p.

_____, 1969, Laboratory theory and methods for sediment analysis: U.S. Geol. Survey Techniques of Water-Resources Inv., book 5, chap. C1, 57 p.

Guy, H. P., and Norman, V. W., 1970, Field methods for measurement of fluvial sediment: U.S. Geol. Survey Techniques of Water-Resources Inv., book 3, chap. C2, 59 p.

Hem, J. D., 1959, Study and interpretation of the chemical characteristics of natural water: U.S. Geol. Survey Water-Supply Paper 1473, 269 p.

Langbein, W. B., and Iseri, K. T., 1960, General introduction and hydrologic definitions: U.S. Geol. Survey Water-Supply Paper 1541-A, 29 p.

Ritter, J. R., and Helley, E. J., 1969, Optical method for determining particle sizes of coarse sediment: U.S. Geol. Survey Techniques of Water-Resources Inv., book 5, chap. C3.

U.S. Inter-Agency Committee on Water Resources, Subcommittee on Sedimentation, A study of methods used in measurement and analysis of sediment loads in streams. Published by the St. Anthony Falls Hydraulic Laboratory, Minneapolis, Minn.

_____, 1941, Methods of analyzing sediment samples: Rept. 4.

_____, 1953, Accuracy of sediment size analyses made by the bottom-withdrawal-tube method: Rept. 10.

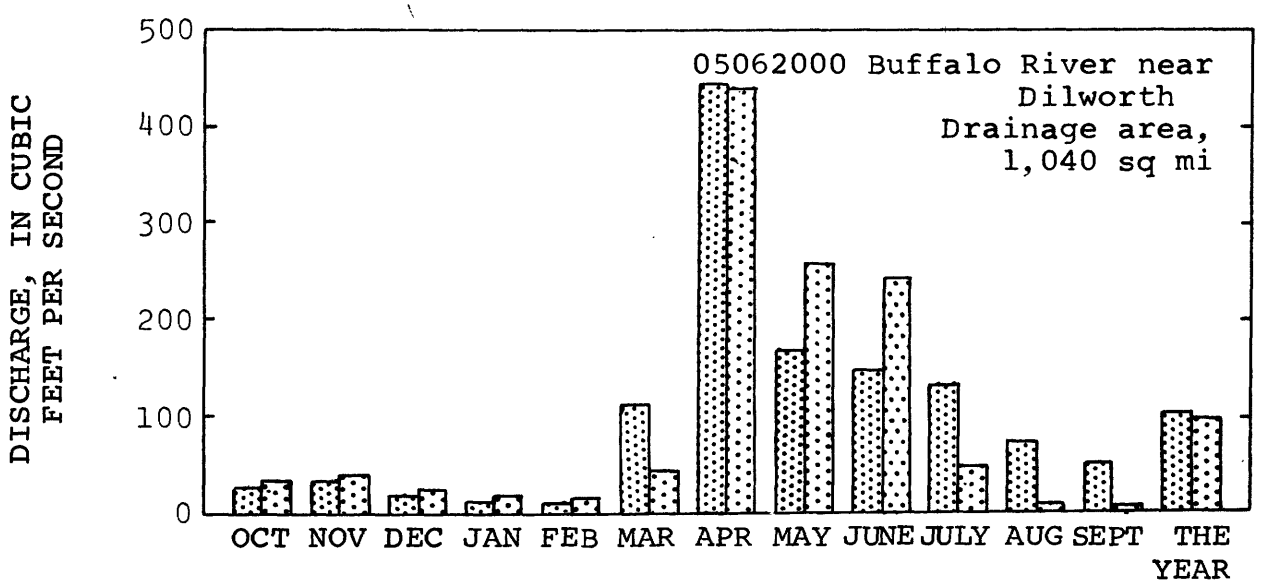
_____, 1957, The development and calibration of visual-accumulation tube: rept. Rept. 11.

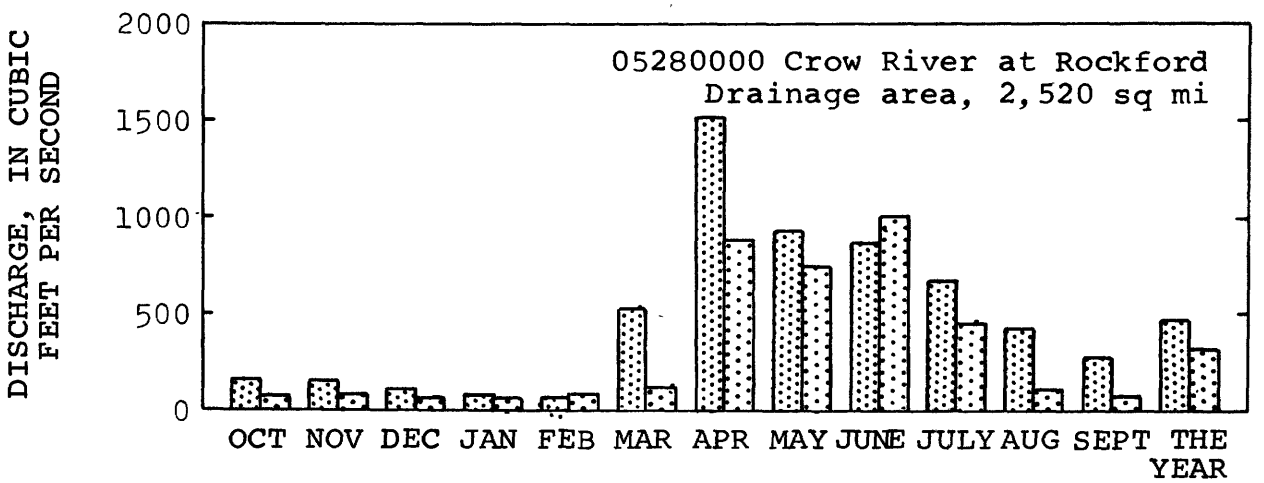
_____, 1957, Some fundamentals of particle size analysis: Rept. 12.

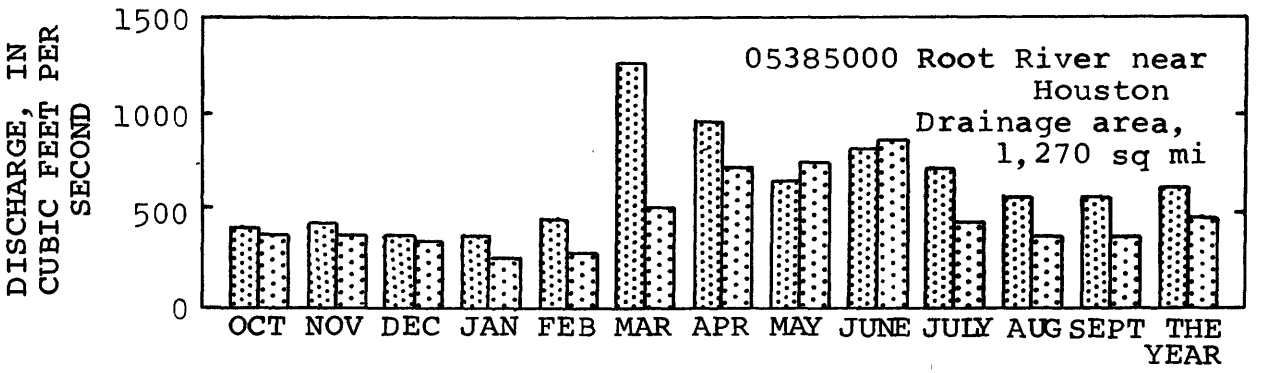
_____, 1959, Federal inter-agency sedimentation instruments and reports: Rept. AA.

_____, 1961, The single stage sampler for suspended sediment: Rept. 13.

_____, 1963, Determinations of fluvial sediment discharge: Rept. 14.







Mean of monthly and yearly mean discharges for water years 1931-60.

Monthly and yearly mean discharges during 1970 water year.

PART 1. SURFACE WATER RECORDS

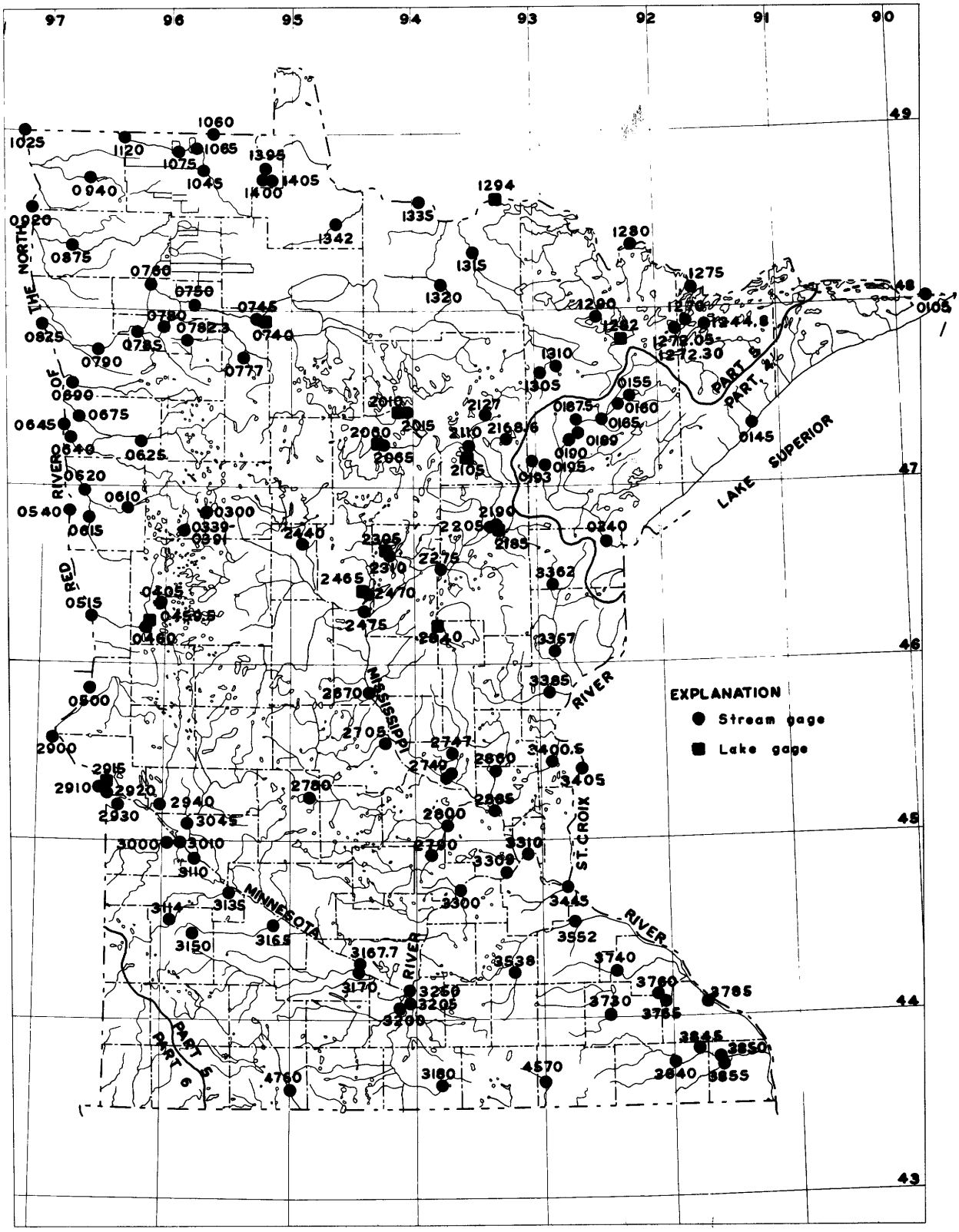


Figure 2.-- Map showing location of lake and stream gaging stations.

04010500 Pigeon River at Middle Falls, near Grand Portage, Minn.

(International gaging station)

LOCATION.--Lat 48°00'44", long 89°36'58", in NE¼ sec.24, T.64 N., R.6 E., Cook County, on right bank 400 ft upstream from Middle Falls, 2.5 miles upstream from Grand Portage Port of Entry, 3.5 miles upstream from mouth, and 4.7 miles northeast of village of Grand Portage.

DRAINAGE AREA.--600 sq mi.

PERIOD OF RECORD.--June to October 1921, April to November 1922, March 1923 to current year. Published as "at International Bridge" April 1924 to September 1940; as "below International Bridge" October 1940 to September 1965. Monthly discharge only for some periods, published in WSP 1307.

GAGE.--Water-stage recorder. Datum of gage is 789.58 ft above mean sea level, datum of 1929. Prior to Sept. 30, 1940, nonrecording gage at International Bridge, 5.8 miles upstream at datum 100.24 ft higher.

AVERAGE DISCHARGE.--47 years (1923-70), 489 cfs (11.07 inches per year).

EXTREMES.--Current year: Maximum discharge, 5,780 cfs Apr. 30 (gage height, 8.40 ft); minimum, 92 cfs Oct. 23 (gage height, 0.57 ft).
Period of record: Maximum discharge, 11,000 cfs May 5, 1934 (gage height, 7.6 ft, site and datum then in use), from rating curve extended above 7,000 cfs; minimum, 27 cfs Nov. 4, 1945 (gage height, -0.08 ft).

REMARKS.--Records good except those for winter months, which are fair.

COOPERATION.--This station is one of the international gaging stations maintained by the United States under agreement with Canada.

REVISIONS (WATER YEARS).--WSP 744: 1927-28. WSP 804: 1934(M). WSP 974: Drainage area. WSP 1337: 1924(M), 1925, 1926-28(M), 1931(M), 1938(M), 1941(M), 1945-46(M), 1947, 1948(M), 1950(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	106	182	114	129	116	106	112	5,380	2,570	943	297	145
2	114	245	112	128	116	109	112	4,510	2,400	811	284	171
3	117	256	110	128	116	130	113	3,750	2,200	764	268	197
4	116	244	104	127	116	155	114	3,320	2,030	757	256	219
5	117	229	104	127	116	150	118	3,050	1,880	713	237	211
6	206	213	105	126	115	147	127	2,760	1,740	659	224	195
7	303	199	107	125	115	143	145	2,500	1,620	627	215	184
8	287	186	110	125	115	136	235	2,370	1,510	655	208	177
9	250	177	113	124	115	130	302	2,430	1,410	672	200	175
10	227	170	115	124	116	127	305	2,700	1,410	624	195	267
11	206	166	127	123	116	126	295	2,730	1,640	589	190	346
12	189	165	132	122	116	125	290	2,590	1,680	578	187	316
13	184	130	130	121	115	125	286	2,410	1,570	582	186	268
14	173	120	122	120	114	125	292	2,230	1,450	565	185	245
15	165	123	116	120	113	125	320	2,260	1,360	552	189	233
16	159	126	115	119	112	125	420	2,360	1,330	546	189	239
17	155	128	127	118	111	126	700	2,300	1,500	518	188	244
18	145	128	125	118	110	127	970	2,170	1,610	488	183	237
19	138	125	119	118	109	128	960	2,040	1,620	490	171	223
20	137	122	113	118	107	129	930	2,030	1,480	495	164	214
21	130	116	109	117	106	130	881	3,860	1,350	478	160	680
22	121	120	108	117	105	130	953	3,620	1,250	447	172	640
23	113	123	108	117	104	132	1,080	3,300	1,170	417	177	483
24	108	121	118	117	103	134	1,300	2,880	1,110	392	178	434
25	114	117	132	117	103	134	1,680	2,860	1,080	372	174	429
26	126	111	140	117	103	135	2,430	3,210	1,010	359	166	427
27	123	107	138	117	103	131	3,450	3,040	956	347	163	409
28	119	108	135	117	104	125	4,060	2,710	917	337	155	376
29	118	111	132	117	------	120	4,240	2,460	872	325	148	343
30	117	113	130	117	------	117	5,620	2,700	841	312	148	316
31	121	------	130	117	------	113	------	2,730	------	302	148	------
TOTAL	4,804	4,581	3,700	3,747	3,110	3,995	32,840	89,260	44,566	16,716	6,005	9,043
MEAN	155	153	119	121	111	129	1,095	2,879	1,486	539	194	301
MAX	303	256	140	129	116	155	5,620	5,380	2,570	943	297	680
MIN	106	107	104	117	103	106	112	2,030	841	302	148	145
CFSM	.26	.25	.20	.20	.19	.21	1.82	4.80	2.48	.90	.32	.50
IN.	.30	.28	.23	.23	.19	.25	2.04	5.53	2.76	1.04	.37	.56

CAL YR 1969 TOTAL 196,315 MEAN 538 MAX 4,550 MIN 65 CFSM .90 IN 12.17
WTR YR 1970 TOTAL 222,367 MEAN 609 MAX 5,620 MIN 103 CFSM 1.02 IN 13.78

PEAK DISCHARGE (BASE, 3,000 CFS)

DATE	TIME	G. H.	DISCHARGE	DATE	TIME	G. H.	DISCHARGE
4-30	2000	8.40	5,780	5-21	0345	7.21	4,150

04014500 Baptism River near Beaver Bay, Minn.

LOCATION.--Lat 47°20'15", long 91°12'00", in SE¼NE¼ sec.15, T.56 N., R.7 W., Lake County, on right bank 30 ft upstream from bridge on U.S. Highway 61, 0.2 mile upstream from mouth, 4 miles northeast of Silver Bay, and 7 miles northeast of village of Beaver Bay.

DRAINAGE AREA.--140 sq mi.

PERIOD OF RECORD.--October 1927 to current year. Monthly discharge only for some periods, published in WSP 1307.

GAGE.--Water-stage recorder. Datum of gage is 609.97 ft above mean sea level (Corps of Engineers bench mark). Prior to Oct. 5, 1934, nonrecording gage at same site and datum.

AVERAGE DISCHARGE.--43 years, 161 cfs (15.62 inches per year).

EXTREMES.--Current year: Maximum discharge, 2,790 cfs Apr. 27 (gage height, 4.10 ft); minimum, 5.1 cfs Sept. 1. Period of record: Maximum discharge recorded, 9,350 cfs Aug. 9, 1939 (gage height, 8.11 ft), from rating curve extended above 4,000 cfs; maximum gage height, 11.06 ft Apr. 12, 1965 (from floodmark, backwater from ice); minimum daily discharge, 0.4 cfs Jan. 5, 6, 1940.

REMARKS.--Records good except those for winter periods, which are fair. Records of chemical analyses, water temperatures and suspended sediment loads for the water year 1970 are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 894: 1939. WSP 1337: 1933-34(M), 1935.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	141	186	42	28	25	22	33	1,990	295	64	14	5.4
2	140	189	33	27	25	21	32	1,760	255	52	13	27
3	122	180	29	27	23	30	30	929	229	48	11	24
4	110	170	27	27	23	37	34	543	213	50	11	16
5	104	162	25	26	24	38	38	526	199	40	10	13
6	144	154	29	26	23	36	50	444	183	33	9.9	12
7	143	143	34	25	24	35	85	399	162	32	9.3	13
8	132	133	41	25	24	34	165	385	143	73	8.8	12
9	125	127	45	25	24	32	200	484	125	86	8.5	14
10	115	119	48	25	24	30	213	460	109	69	7.9	20
11	103	114	49	25	24	29	210	399	101	52	7.6	16
12	92	107	47	25	24	27	200	328	103	39	8.2	14
13	88	100	44	25	24	26	273	291	122	39	8.2	13
14	86	79	42	25	24	25	339	250	118	33	7.1	13
15	81	72	41	24	23	24	428	259	106	41	14	17
16	74	75	39	24	22	24	577	259	157	46	12	20
17	69	82	38	24	22	24	603	238	192	41	10	18
18	65	68	37	24	23	25	534	223	301	31	9.6	16
19	59	60	35	24	22	26	452	215	273	40	9.0	15
20	66	57	33	24	22	26	339	235	226	45	7.9	14
21	70	56	29	24	21	28	364	413	206	41	7.1	35
22	68	70	25	23	22	32	345	357	192	33	7.4	26
23	60	72	25	22	22	35	385	301	170	26	8.5	22
24	65	73	28	22	23	37	413	268	151	22	7.9	21
25	92	68	30	22	23	40	648	255	124	20	6.8	21
26	125	55	32	22	23	43	1,400	241	112	18	6.3	22
27	118	50	31	23	23	41	1,850	226	101	19	6.3	20
28	115	54	30	24	22	39	2,290	215	94	17	6.1	19
29	103	53	29	25	------	37	2,170	213	85	16	5.6	18
30	98	50	28	26	------	35	2,090	226	70	17	5.8	17
31	118	------	28	26	------	33	------	235	------	17	5.8	------
TOTAL	3,091	2,978	1,073	764	648	971	16,790	13,567	4,917	1,200	270.6	533.4
MEAN	99.7	99.3	34.6	24.6	23.1	31.3	560	438	164	38.7	8.73	17.8
MAX	144	189	49	28	25	43	2,290	1,990	301	86	14	35
MIN	59	50	25	22	21	21	30	213	70	16	5.6	5.4
CFSM	.71	.71	.25	.18	.17	.22	4.00	3.13	1.17	.28	.06	.13
IN.	.82	.79	.29	.20	.17	.26	4.46	3.60	1.31	.32	.07	.14

CAL YR 1969 TOTAL 69,606.0 MEAN 191 MAX 2,120 MIN 11 CFSM 1.36 IN 18.50
WTR YR 1970 TOTAL 46,803.0 MEAN 128 MAX 2,290 MIN 5.4 CFSM .91 IN 12.44

PEAK DISCHARGE (BASE, 1,300 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
4-27	2245	4.10	2,790				

04015500 Second Creek near Aurora, Minn.

LOCATION.--Lat 47°31'25", long 92°11'35", in SW¼ sec.12, T.58 N., R.15 W., St. Louis County, on left bank 0.1 mile downstream from First Creek, 0.4 mile upstream from mouth, and 2.1 miles east of Aurora.

DRAINAGE AREA.--26.3 sq mi.

PERIOD OF RECORD.--March 1955 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,410.36 ft above mean sea level, datum of 1929 (levels by Erie Mining Company).

AVERAGE DISCHARGE.--15 years, 21.3 cfs (11.00 inches per year).

EXTREMES.--Current year: Maximum discharge, 95 cfs Apr. 27 (gage height, 4.74 ft); maximum gage height, 5.66 ft Mar. 22 (backwater from ice); minimum discharge, 8.1 cfs Sept. 9 (gage height, 3.53 ft).
Period of record: Maximum discharge, 213 cfs Apr. 22, 1961; maximum gage height, 5.75 ft Mar. 28, 1957 (backwater from ice); minimum daily discharge, 1.5 cfs Jan. 26 to Feb. 4, 1963; minimum gage height, 3.10 ft Feb. 2, 3, 4, 1963.

REMARKS.--Records good except those for winter months, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	38	40	20	10	17	28	37	62	56	25	30	12
2	36	44	20	9.8	16	28	36	53	51	24	28	14
3	33	40	19	9.8	16	27	35	48	45	25	26	12
4	31	37	19	9.6	16	27	35	44	41	27	25	13
5	30	36	19	9.4	18	26	36	44	37	26	25	12
6	32	36	19	9.2	18	25	38	44	33	25	25	11
7	32	35	20	9.0	17	24	50	44	29	25	25	9.6
8	33	36	20	9.0	17	23	70	44	29	27	25	9.4
9	30	34	20	9.4	17	23	60	51	29	28	25	8.7
10	30	31	20	10	18	23	52	50	42	28	24	9.7
11	28	30	20	11	18	22	47	46	56	27	22	12
12	26	30	19	11	20	22	42	41	56	28	22	13
13	27	28	19	10	21	22	36	39	58	29	21	14
14	26	26	18	9.5	20	22	36	39	59	29	19	15
15	25	25	18	9.1	19	22	35	43	55	31	17	14
16	24	23	17	9.3	18	22	35	45	50	30	14	14
17	22	22	17	9.8	18	22	34	43	49	28	12	14
18	21	22	16	11	17	25	33	40	47	27	11	15
19	20	21	15	12	17	30	32	38	41	32	11	13
20	20	21	15	12	18	40	31	37	39	31	9.4	12
21	20	22	14	12	18	50	34	43	40	31	10	12
22	21	22	14	11	19	65	39	44	39	30	11	11
23	20	23	13	11	20	62	43	40	38	30	10	11
24	21	23	13	11	21	60	51	53	36	29	9.9	11
25	25	22	12	12	23	58	57	61	34	28	9.9	11
26	30	21	12	12	27	55	58	58	36	27	10	11
27	29	19	11	13	28	54	85	56	36	25	10	12
28	27	19	11	14	28	51	83	48	36	24	8.7	13
29	24	19	11	15	------	48	75	48	32	23	8.5	15
30	24	20	10	15	------	44	72	59	28	25	11	16
31	28	------	10	17	------	41	------	57	------	28	12	------
TOTAL	833	827	501	342.9	540	1,091	1,407	1,462	1,257	852	527.4	370.4
MEAN	26.9	27.6	16.2	11.1	19.3	35.2	46.9	47.2	41.9	27.5	17.0	12.3
MAX	38	44	20	17	28	65	85	62	59	32	30	16
MIN	20	19	10	9.0	16	22	31	37	28	23	8.5	8.7
CFSM	1.02	1.05	.62	.42	.73	1.34	1.78	1.79	1.59	1.05	.65	.47
IN.	1.18	1.17	.71	.49	.76	1.54	1.99	2.07	1.78	1.21	.75	.52

CAL YR 1969 TOTAL 13,311.0 MEAN 36.5 MAX 126 MIN 10 CFSM 1.39 IN 18.83
WTR YR 1970 TOTAL 10,010.7 MEAN 27.4 MAX 85 MIN 8.5 CFSM 1.04 IN 14.16

PEAK DISCHARGE (BASE, 60 CFS)

DATE	TIME	G. H.	DISCHARGE	DATE	TIME	G. H.	DISCHARGE
3-22	0845	5.66	87	4-27	1415	4.74	95
4-08	0530	5.13	75	5-25	1715	4.40	62

04016000 Partridge River near Aurora, Minn.

LOCATION.--Lat 47°31'02", long 92°11'24", in SE¼SW¼ sec.12, T.58 N., R.15 W., St. Louis County, on right bank at upstream side of highway bridge, 1,000 ft downstream from Second Creek, 2.5 miles east of Aurora, and 2.8 miles upstream from mouth.

DRAINAGE AREA.--156 sq mi.

PERIOD OF RECORD.--August 1942 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,402.30 ft above mean sea level, datum of 1929. Aug. 5, 1942, to Aug. 25, 1944, nonrecording gage, and Aug. 26, 1944, to July 1, 1956, water-stage recorder at site 45 ft downstream at same datum.

AVERAGE DISCHARGE (adjusted for storage and diversion).--28 years, 125 cfs (10.88 inches per year).

EXTREMES.--Current year: Maximum discharge, 1,010 cfs May 2 (gage height, 5.25 ft); minimum daily, 16 cfs Aug. 25, 26, 28, 29.
Period of record: Maximum discharge, 3,230 cfs May 10, 1950 (gage height, 7.86 ft); minimum, 2.2 cfs Jan. 30, 31, 1961; minimum gage height, 0.88 ft Mar. 2, 1963.

REMARKS.--Records good except those for winter periods, which are fair. Flow regulated at times by storage in off-channel Partridge Reservoir, formerly known as Whitewater Lake. Reservoir formed from lake by levees around marsh areas and natural outlet. Available capacity, 20,000 acre-ft between elevations 1,410 (natural lake level) and 1,440 ft. Storage began Apr. 9, 1955. Storage in reservoir obtained from Colby Lake during periods of high flow; release from storage returned to Colby Lake to maintain lake elevation during diversion for iron-ore processing. Diversion began Feb. 7, 1956. Some seepage losses from reservoir bypass station.

REVISIONS (WATER YEARS).--WSP 974: 1942. WSP 1307: 1943(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	87	119	56	26	28	38	54	959	427	55	41	18
2	78	137	54	25	28	38	56	993	399	56	39	23
3	71	155	53	24	28	38	57	896	359	57	37	21
4	70	171	51	23	29	37	56	784	307	58	37	20
5	71	159	49	21	31	36	59	681	273	56	37	20
6	68	135	49	21	31	35	61	592	228	53	36	18
7	72	99	49	20	30	34	73	519	191	51	36	18
8	70	79	50	20	30	34	106	462	163	52	36	18
9	66	76	51	20	30	34	94	433	142	51	35	17
10	68	81	50	21	30	33	92	393	147	50	34	19
11	63	76	49	22	31	32	99	372	157	49	32	20
12	71	70	48	24	32	32	88	356	160	48	31	22
13	71	66	48	24	33	32	77	335	167	48	31	22
14	67	60	47	24	34	32	78	314	167	49	29	23
15	61	57	46	23	32	32	81	289	161	52	27	23
16	63	56	45	23	30	33	92	271	152	48	24	25
17	58	55	44	23	29	33	85	266	144	46	22	24
18	58	54	43	24	29	34	79	257	134	47	20	25
19	60	53	42	26	29	38	76	239	124	54	20	24
20	58	54	41	27	29	42	71	225	118	53	17	23
21	60	54	39	26	29	53	67	223	114	54	17	23
22	58	55	37	25	30	68	73	230	107	55	19	22
23	59	57	35	24	30	75	82	240	100	54	18	21
24	61	59	34	23	32	80	92	279	90	53	17	20
25	68	59	32	23	33	81	101	328	83	50	16	20
26	78	60	32	24	36	78	102	360	80	48	16	21
27	81	58	31	25	37	74	153	406	77	44	17	24
28	85	56	30	25	38	70	233	395	74	41	16	24
29	88	54	29	26	------	68	370	389	66	40	16	25
30	90	55	28	27	------	67	753	435	59	41	17	28
31	100	------	27	28	------	61	------	430	------	42	18	------
TOTAL	2,179	2,379	1,319	737	868	1,472	3,560	13,351	4,970	1,555	808	651
MEAN	70.3	79.3	42.5	23.8	31.0	47.5	119	431	166	50.2	26.1	21.7
MAX	100	171	56	28	38	81	753	993	427	58	41	28
MIN	58	53	27	20	28	32	54	223	59	40	16	17
(ƒ)	+18.8	+25.9	+4.52	+2.94	-0.36	+0.41	+133	+209	+26.4	+0.80	+17.0	-0.43
MEAN ≠	89.1	105	47.0	26.7	30.6	47.9	252	452	192	49.4	43.1	21.3
CFSM ≠	0.57	0.67	0.30	0.17	0.20	0.31	1.62	2.90	1.23	0.32	0.28	0.14
IN. ≠	0.66	0.75	0.35	0.20	0.20	0.35	1.80	3.33	1.37	0.37	0.32	0.15

CAL YR 1969	MEAN	157	MEAN ≠	175	MAX	1,600	MIN	27	CFSM ≠	1.12	IN. ≠	15.23
WTR YR 1970	MEAN	92.7	MEAN ≠	112	MAX	993	MIN	16	CFSM ≠	0.72	IN. ≠	9.73

ƒ Change in contents in Partridge Reservoir and diversion to iron-ore processing plant, equivalent in cubic feet per second; furnished by Erie Mining Co.
≠ Adjusted for change in contents and diversion.

04016500 St. Louis River near Aurora, Minn.

LOCATION.--Lat 47°29'30", long 92°14'20", in SW¼ sec.22, T.58 N., R.15 W., St. Louis County, on left bank at upstream side of highway bridge, 0.8 mile downstream from Partridge River and 1.5 miles south of Aurora.

DRAINAGE AREA.--312 sq mi.

PERIOD OF RECORD.--August 1942 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,371.24 ft above mean sea level, datum of 1929. Prior to Aug. 26, 1944, nonrecording gage at same site and datum.

AVERAGE DISCHARGE (adjusted for storage and diversion).--28 years, 242 cfs (10.53 inches per year).

EXTREMES.--Current year: Maximum discharge, 1,700 cfs May 2 (gage height, 4.50 ft); minimum, 24 cfs Aug. 28-30 (gage height, 0.74 ft).
Period of record: Maximum discharge, 5,380 cfs May 14, 1950 (gage height, 8.37 ft); minimum, 4.0 cfs Oct. 2, 3, 1948 (gage height, 0.30 ft).

REMARKS.--Records good except those for winter months, which are fair. Flow regulated at times by storage in off-channel Partridge Reservoir, formerly known as Whitewater Lake. Reservoir formed from lake by levees around marsh areas and natural outlet. Available capacity 20,000 acre-ft between elevations 1,410 ft (natural lake level) and 1,440 ft. Storage began Apr. 9, 1955. Storage in reservoir obtained from Colby Lake during periods of high flow; release from storage returned to Colby Lake to maintain lake elevation during diversion for iron-ore processing. Diversion began Feb. 7, 1956. Some seepage losses from reservoir enter above station.

REVISIONS (WATER YEARS).--WSP 1337: 1950.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	142	195	122	67	57	70	100	1,620	794	105	56	26
2	137	225	120	63	56	71	100	1,690	763	102	56	32
3	130	256	116	59	54	73	102	1,620	709	104	56	32
4	132	278	111	56	55	81	105	1,520	647	104	57	29
5	135	271	107	53	58	80	108	1,430	579	98	57	28
6	135	240	106	52	60	77	110	1,320	504	91	56	27
7	136	204	105	50	61	75	115	1,230	444	88	55	27
8	137	178	105	50	61	72	145	1,130	389	86	55	27
9	127	177	106	51	60	70	200	1,080	348	82	54	26
10	125	178	103	52	60	69	215	1,020	340	79	52	29
11	116	176	99	53	60	68	214	974	344	75	51	28
12	120	166	98	54	59	67	203	920	336	72	49	30
13	123	158	97	56	59	66	190	870	336	72	48	31
14	119	150	94	58	58	66	183	816	325	72	46	31
15	113	142	92	60	58	66	188	779	307	79	44	33
16	114	136	90	61	59	66	193	738	289	71	39	35
17	108	132	88	62	61	66	201	699	268	67	35	34
18	105	130	86	62	63	70	204	661	245	73	32	33
19	107	128	84	61	63	82	208	618	226	87	31	33
20	105	126	80	62	61	95	209	589	216	78	29	31
21	108	126	77	63	63	116	235	599	208	76	28	33
22	106	127	72	63	65	134	293	603	196	77	30	31
23	104	129	66	62	69	146	340	599	183	76	29	30
24	107	132	64	60	71	150	389	656	167	74	27	29
25	118	133	64	62	70	150	469	743	154	70	27	29
26	134	134	65	63	70	147	537	784	149	67	26	30
27	136	132	66	63	69	140	719	800	145	63	25	30
28	141	127	68	63	69	132	887	774	140	59	25	31
29	141	121	69	61	------	120	1,050	774	126	58	24	32
30	144	122	70	60	------	112	1,410	826	116	58	25	35
31	162	------	70	59	------	105	------	805	------	57	26	------
TOTAL	3,867	4,929	2,760	1,821	1,729	2,902	9,622	29,287	9,993	2,420	1,250	912
MEAN	125	164	89.0	58.7	61.8	93.6	321	945	333	78.1	40.3	30.4
MAX	162	278	122	67	71	150	1,410	1,690	794	105	57	35
MIN	104	121	64	50	54	66	100	589	116	57	24	26
(≠)	+18.8	+25.9	+4.52	+2.94	+0.36	+0.41	+133	+20.9	+26.4	+0.80	+17.0	+0.43
MEAN ≠	144	190	93.5	61.6	61.4	94.0	454	966	359	77.3	57.3	30.0
CFSM ≠	0.46	0.61	0.30	0.20	0.20	0.30	1.46	3.10	1.15	0.25	0.18	0.10
IN. ≠	0.53	0.68	0.35	0.23	0.20	0.35	1.62	3.57	1.28	0.29	0.21	0.11

CAL YR 1969	MEAN	301	MEAN ≠	319	MAX	2,140	MIN	64	CFSM ≠	1.02	IN. ≠	13.88
WTR YR 1970	MEAN	196	MEAN ≠	215	MAX	1,690	MIN	24	CFSM ≠	0.69	IN. ≠	9.36

≠ Change in contents in Partridge Reservoir and diversion to iron-ore processing plant, equivalent in cubic feet per second; furnished by Erie Mining Co.
≠ Adjusted for change in contents and diversion.

04018750 St. Louis River at Forbes, Minn.

LOCATION.--Lat 47°21'48", long 92°35'56", in NE¼SE¼ sec.3, T.56 N., R.18 W., St. Louis County, on right bank at downstream side of highway bridge, 0.5 mile downstream from Eveleth Taconite Company dam, 0.6 mile south of Forbes, 1.8 miles upstream from Elbow Creek.

PERIOD OF RECORD.--August 1964 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,293.11 ft above mean sea level, datum of 1929. Prior to Oct. 28, 1964, nonrecording gage at same site and datum.

AVERAGE DISCHARGE.--6 years, 565 cfs.

EXTREMES.--Current year: Maximum discharge, 2,970 cfs May 3 (gage height, 12.63 ft); minimum, 39 cfs Aug. 4, 5 (gage height, 5.42 ft).
Period of record: Maximum discharge, 5,180 cfs Apr. 18, 1969 (gage height, 15.77 ft); minimum, 24 cfs Nov. 26, 1966 (gage height, 5.23 ft).

REMARKS.--Records good except those for winter months, which are fair. There is some regulation at medium and low flows and diversion for iron-ore processing at Eveleth Taconite Company dam 0.5 mile upstream. Diversion began Dec. 5, 1965. Records of water temperatures and suspended sediment loads for the water year 1970 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	409	485	370	168	118	110	192	2,710	1,770	205	132	63
2	435	659	350	166	118	112	190	2,850	1,620	263	126	71
3	427	645	335	160	115	117	190	2,880	1,610	284	89	58
4	405	592	330	155	112	120	192	2,870	1,500	294	155	62
5	394	789	325	150	105	120	210	2,870	1,370	282	43	69
6	391	787	320	142	102	125	220	2,670	1,260	213	129	68
7	386	707	310	137	105	125	290	2,580	1,140	161	123	66
8	375	651	305	133	112	122	450	2,300	876	222	129	67
9	364	599	300	130	110	122	700	2,240	938	231	112	67
10	264	573	295	120	110	120	920	2,100	889	223	74	68
11	335	555	290	50	108	120	950	1,920	959	215	82	68
12	353	535	290	115	108	117	960	1,670	982	206	135	68
13	342	505	285	150	107	115	987	1,630	962	140	113	68
14	336	466	280	120	105	112	988	1,590	961	171	93	67
15	322	434	270	115	102	110	968	1,520	974	209	93	70
16	310	400	260	112	100	108	976	1,370	1,010	203	89	55
17	302	375	250	115	97	105	1,000	1,360	1,030	187	83	41
18	292	370	245	115	95	107	995	1,130	1,020	184	77	48
19	279	360	235	112	98	110	975	1,200	979	219	74	68
20	274	375	230	110	102	113	939	1,080	922	198	71	78
21	271	410	220	107	100	120	883	1,110	864	210	59	83
22	266	440	210	110	100	130	961	1,130	750	135	41	80
23	257	420	203	108	105	150	1,020	1,050	697	193	41	80
24	253	390	198	110	108	180	1,190	1,100	685	193	44	76
25	263	370	192	112	112	210	1,500	1,210	616	187	54	77
26	298	365	187	112	115	235	1,690	1,370	564	184	64	77
27	241	385	183	115	115	225	1,910	1,920	519	175	64	80
28	294	415	178	115	110	215	2,230	1,430	484	164	64	80
29	402	435	175	118	------	205	2,370	1,470	444	135	63	81
30	265	400	172	120	------	200	2,470	1,660	240	138	63	81
31	360	------	170	120	------	195	------	1,790	------	138	62	------
TOTAL	10,165	14,892	7,963	3,822	2,994	4,375	29,516	55,780	28,635	6,162	2,641	2,085
MEAN	328	496	257	123	107	141	984	1,799	955	199	85.2	69.5
MAX	435	789	370	168	118	235	2,470	2,880	1,770	294	155	83
MIN	241	360	170	50	95	105	190	1,050	240	135	41	41

CAL YR 1969 TOTAL 241,799 MEAN 662 MAX 5,170 MIN 93
WTR YR 1970 TOTAL 169,030 MEAN 463 MAX 2,880 MIN 41

04018900 East Two River near Iron Junction, Minn.

LOCATION.--Lat 47°24'04", long 92°39'52", in NW¼NW¼ sec.29, T.57 N., R.18 W., St. Louis County, on right bank 30 ft downstream from bridge on State Highway 37 and 2.2 miles southwest of Iron Junction.

DRAINAGE AREA.--40.0 sq mi.

PERIOD OF RECORD.--June 1966 to current year. Occasional low-flow measurements, water years 1957-62.

GAGE.--Water-stage recorder. Altitude of gage is 1,335 ft (from topographic map).

EXTREMES.--Current year: Maximum discharge, 297 cfs Apr. 28 (gage height, 8.91 ft); minimum daily, 4.6 cfs Jan. 27-30; minimum gage height, 2.82 ft Aug. 7, 8.
Period of record: Maximum discharge, 395 cfs Aug. 25, 1968 (gage height, 9.43 ft); maximum gage height, 9.65 ft Apr. 10, 1969 (backwater from ice); minimum daily discharge, 4.6 cfs Jan. 27-30, 1970.

REMARKS.--Records good except those for winter months, which are fair.

COOPERATION.--Records computed by U.S. Steel Corporation and reviewed by Geological Survey.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	43	66	12	10	4.7	9.8	15	215	75	17	9.1	8.3
2	44	87	12	9.8	4.7	10	15	169	68	16	8.8	10
3	39	76	13	9.6	4.8	10	15	128	55	16	8.1	10
4	34	64	13	9.4	4.8	10	15	93	45	16	7.7	9.4
5	31	54	13	9.2	4.9	10	16	77	38	15	7.5	9.1
6	30	47	12	9.0	5.0	10	20	64	32	14	7.1	8.8
7	28	39	12	8.8	5.1	10	45	49	27	14	6.5	8.5
8	25	34	12	8.4	5.2	11	90	45	23	14	6.5	8.3
9	25	30	12	8.2	5.4	11	110	53	21	14	6.7	8.3
10	25	27	12	8.0	5.5	11	105	56	35	13	6.7	8.5
11	26	26	12	7.9	5.6	11	95	55	85	13	6.9	8.5
12	26	25	12	7.7	5.8	11	85	54	135	12	7.3	8.5
13	27	23	12	7.5	6.0	11	75	49	135	12	6.7	8.5
14	26	20	12	7.2	6.2	11	68	40	103	12	6.9	8.5
15	24	16	12	7.0	6.4	11	64	40	74	14	7.3	9.4
16	23	14	12	6.8	6.6	11	69	43	58	14	7.3	10
17	23	12	12	6.6	6.8	12	71	44	46	13	7.3	10
18	22	11	12	6.4	7.1	12	71	41	44	13	7.3	10
19	21	10	12	6.2	7.4	12	65	36	43	17	7.3	10
20	20	10	12	5.9	7.6	13	57	31	40	17	7.9	10
21	20	10	12	5.6	7.9	14	57	28	35	14	7.9	13
22	20	10	12	5.5	8.3	15	60	30	31	13	8.3	13
23	21	11	12	5.3	8.6	17	74	29	26	12	8.5	13
24	19	11	11	5.1	9.0	18	115	30	23	12	8.3	12
25	21	11	11	4.8	9.1	19	201	33	23	12	8.3	12
26	26	11	11	4.8	9.3	19	258	35	21	12	8.1	12
27	27	11	11	4.6	9.4	18	275	32	20	11	8.1	11
28	26	11	11	4.6	9.6	17	294	28	20	11	7.9	11
29	26	12	11	4.6	------	16	278	33	19	11	8.1	10
30	26	12	10	4.6	------	16	263	69	17	11	8.3	10
31	32	------	10	4.7	------	15	------	74	------	10	8.1	------
TOTAL	826	801	365	213.8	186.8	401.8	3,041	1,803	1,417	415	236.8	299.6
MEAN	26.6	26.7	11.8	6.90	6.67	13.0	101	58.2	47.2	13.4	7.64	9.99
MAX	44	87	13	10	9.6	19	294	215	135	17	9.1	13
MIN	19	10	10	4.6	4.7	9.8	15	28	17	10	6.5	8.3
CFSM	.67	.67	.30	.17	.17	.33	2.53	1.46	1.18	.34	.19	.25
IN.	.77	.74	.34	.20	.17	.37	2.83	1.68	1.32	.39	.22	.29

CAL YR 1969 TOTAL 14,038.0 MEAN 38.5 MAX 360 MIN 10 CFSM .96 IN 13.06
WTR YR 1970 TOTAL 10,006.8 MEAN 27.4 MAX 294 MIN 4.6 CFSM .69 IN 9.31

04019000 West Two River near Iron Junction, Minn.

LOCATION.--Lat 47°24'05", long 92°42'10", in SW¼SW¼ sec.24, T.57 N., R.19 W., St. Louis County, on right bank 40 ft upstream from bridge on State Highway 37, 5 miles southwest of Iron Junction, and 9.2 miles upstream from St. Louis River.

DRAINAGE AREA.--68.4 sq mi.

PERIOD OF RECORD.--October 1953 to September 1962, October 1965 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,322.05 ft above mean sea level, datum of 1929 (Minnesota Highway Department bench mark).

AVERAGE DISCHARGE.--14 years, 45.9 cfs (9.11 inches per year).

EXTREMES.--Current year: Maximum discharge, 568 cfs Apr. 28 (gage height, 8.29 ft); minimum, 7.5 cfs Aug. 26 (gage height, 2.58 ft).
Period of record: Maximum discharge, 916 cfs Apr. 17, 1954 (gage height, 9.85 ft); minimum daily, 3.0 cfs Jan. 22 to Feb. 6, 1957; minimum gage height, 2.34 ft Aug. 15-17, 24-28, 1961. Oct. 31, Nov. 1, 1967.

REMARKS.--Records good except those for winter months, which are fair. Flow regulated at times by storage in West Two Rivers Reservoir for taconite processing at U.S. Steel Mountain Iron Taconite Plant. The reservoir impounds water from the upper 27.9 sq miles of the drainage area and has an available capacity of 8,500 acre-ft between elevations 1370 (natural inlet) and 1395 ft (crest of spillway at outlet dam). Storage began July 28, 1966. Some seepage losses from reservoir enter above station.

COOPERATION.-- Records for 1970 water year computed by U.S. Steel Corporation and reviewed by Geological Survey.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	41	60	28	19	14	15	19	420	95	24	13	9.2
2	40	70	28	19	14	15	19	329	89	22	11	11
3	38	90	28	19	14	15	19	260	78	21	11	9.2
4	37	93	27	18	14	15	20	211	66	22	10	9.6
5	34	87	27	18	14	15	22	178	56	19	9.2	8.8
6	33	79	26	18	14	15	35	144	48	19	9.2	9.2
7	32	73	26	18	14	15	80	119	40	19	9.2	9.2
8	29	72	25	18	14	15	130	108	35	19	8.4	9.2
9	27	67	24	17	14	16	225	112	35	18	8.4	9.2
10	27	60	23	17	14	16	270	109	62	18	7.9	9.2
11	28	55	23	17	14	16	220	110	96	18	7.9	9.2
12	27	50	22	17	14	16	184	99	115	16	8.4	8.8
13	26	46	22	17	14	16	159	88	109	16	8.4	8.8
14	26	41	21	17	14	16	150	81	90	15	7.9	8.8
15	25	36	21	16	14	17	150	80	77	16	8.4	10
16	25	33	21	16	14	17	149	83	70	15	7.9	11
17	24	31	21	16	14	17	146	79	64	17	7.9	11
18	24	29	21	16	14	17	136	73	59	17	7.9	11
19	23	28	21	15	14	18	124	67	54	22	8.4	11
20	23	27	20	15	14	19	122	61	49	20	7.9	11
21	24	27	20	15	14	19	113	64	44	19	7.9	18
22	23	27	20	15	14	20	110	62	43	18	8.8	19
23	22	27	20	15	14	21	127	57	38	16	8.4	19
24	21	28	20	15	14	22	163	58	35	15	7.9	18
25	23	28	20	15	14	22	244	60	33	17	7.9	18
26	29	28	20	15	14	22	336	60	33	18	7.9	17
27	28	29	20	14	14	21	472	57	30	17	7.9	17
28	27	29	19	14	14	20	558	54	29	17	8.3	16
29	27	29	19	14	------	20	545	57	27	17	8.3	16
30	28	29	19	14	------	19	505	83	26	15	8.8	12
31	35	------	19	14	------	19	------	89	------	15	8.3	------
TOTAL	876	1,417	691	503	392	546	5,552	3,512	1,725	557	268.7	364.4
MEAN	28.3	47.2	22.3	16.2	14.0	17.6	185	113	57.5	18.0	8.67	12.1
MAX	41	93	28	19	14	22	558	420	115	24	13	19
MIN	21	27	19	14	14	15	19	54	26	15	7.9	8.8
CFSM	.41	.69	.33	.24	.20	.26	2.70	1.65	.84	.26	.13	.18
IN.	.48	.77	.38	.27	.21	.30	3.02	1.91	.94	.30	.15	.20

CAL YR 1969 TOTAL 21,613.0 MEAN 59.2 MAX 708 MIN 12 CFSM .87 IN 11.75
WTR YR 1970 TOTAL 16,404.1 MEAN 44.9 MAX 558 MIN 7.9 CFSM .66 IN 8.92

04019300 West Swan River near Silica, Minn.

LOCATION.--Lat 47°17'36", long 93°02'30", in SW¼NW¼ sec.32, T.56 N., R.21 W., St. Louis County, on right bank 10 ft upstream from pilings of dismantled bridge and railroad bed of Great Northern Railroad, 2 miles northwest of Silica, 9 miles southwest of Hibbing and 20 miles upstream from confluence of East Swan and West Swan.

PERIOD OF RECORD.--April 1963 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,360 ft (from topographic map). Prior to Aug. 2, 1963, reference point at same site and datum.

AVERAGE DISCHARGE.--7 years, 10.8 cfs.

EXTREMES.--Current year: Maximum discharge, 314 cfs Apr. 27 (gage height, 4.42 ft); no flow Aug. 18 to Sept. 30. Period of record: Maximum discharge, 399 cfs Apr. 11, 1969 (gage height, 4.92 ft); maximum gage height, 5.17 ft Mar. 28, 1968 (backwater from ice); no flow Aug. 20 to Sept. 4, 1969, Aug. 18 to Sept. 30, 1970.

REMARKS.--Records good except those for winter months, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.0	3.3	.60	.40	.30	.50	4.4	41	28	.30	.50	
2	1.9	4.8	.60	.40	.30	.50	4.0	25	33	.20	.30	
3	1.8	4.5	.60	.40	.30	.60	3.8	19	19	.20	.20	
4	1.6	3.7	.50	.40	.20	.90	3.8	15	11	.20	.20	
5	1.5	3.2	.50	.40	.20	.90	5.5	12	7.3	.20	.20	
6	1.8	2.8	.40	.30	.20	.80	8.2	10	4.6	.20	.20	
7	1.8	2.6	.50	.30	.20	.80	23	8.5	3.3	.50	.10	
8	1.4	2.3	.60	.30	.20	.70	85	7.8	2.7	1.6	.10	
9	1.2	2.2	.60	.30	.30	.70	142	9.0	1.7	1.4	.10	
10	1.4	2.1	.60	.30	.30	.60	96	11	1.7	.90	.10	
11	1.3	2.0	.60	.30	.40	.60	64	11	5.9	.50	.20	
12	1.3	1.9	.60	.30	.40	.60	48	9.6	11	.30	.10	
13	1.3	1.8	.60	.30	.50	1.0	38	8.0	6.2	.20	.10	
14	1.3	1.5	.60	.20	.50	1.7	32	6.4	4.1	.20	.10	
15	1.2	1.3	.60	.20	.50	2.7	25	8.2	3.3	.60	.10	
16	1.5	1.1	.50	.20	.40	3.5	24	13	3.2	.40	.10	
17	1.5	1.0	.50	.20	.40	4.2	21	12	3.0	.30	.10	
18	1.3	.90	.50	.20	.40	4.8	17	8.8	2.5	.90	0	
19	1.2	.80	.50	.30	.50	5.2	13	7.1	2.3	2.7	0	
20	1.2	.70	.50	.30	.90	5.5	9.0	6.2	1.9	2.1	0	
21	1.2	.70	.50	.40	1.2	5.8	11	9.6	1.4	1.4	0	
22	1.2	.70	.40	.40	1.1	6.0	10	9.0	1.4	.90	0	
23	1.1	.70	.40	.40	1.0	6.4	12	7.5	1.3	.60	0	
24	1.1	.70	.40	.50	.90	7.0	23	6.4	1.0	.40	0	
25	1.4	.70	.40	.50	.70	8.0	92	7.1	.80	.40	0	
26	1.8	.80	.40	.50	.60	9.0	233	7.5	1.1	.30	0	
27	1.9	.80	.40	.50	.50	10	280	6.6	1.1	.30	0	
28	1.8	.80	.40	.40	.50	11	216	5.3	1.0	.30	0	
29	1.7	.70	.40	.40	------	8.0	110	6.0	.70	1.0	0	
30	1.8	.70	.40	.30	------	6.5	63	16	.40	.90	0	
31	2.2	------	.40	.30	------	5.0	------	16	------	.70	0	------
TOTAL	46.7	51.80	15.50	10.60	13.90	119.50	1,716.7	345.6	165.90	21.10	2.80	0
MEAN	1.51	1.73	.50	.34	.50	3.85	57.2	11.1	5.53	.68	.090	0
MAX	2.2	4.8	.60	.50	1.2	11	280	41	33	2.7	.50	0
MIN	1.1	.70	.40	.20	.20	.50	3.8	5.3	.40	.20	0	0

CAL YR 1969 TOTAL 2,605.70 MEAN 7.14 MAX 298 MIN 0
WTR YR 1970 TOTAL 2,510.10 MEAN 6.88 MAX 280 MIN 0

04019500 East Swan River near Toivola, Minn.

LOCATION.--Lat 47°16'55", long 92°50'05", in NE¼NE¼ sec.2, T.55 N., R.20 W., St. Louis County, on left bank 350 ft downstream from bridge on St. Louis County Road 442, 4.8 miles upstream from confluence with West Swan River, 8 miles northwest of Toivola, and 8.8 miles upstream from St. Louis River.

DRAINAGE AREA.--112 sq mi.

PERIOD OF RECORD.--September 1953 to September 1962, October 1964 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,260.46 ft above mean sea level, datum of 1929.

AVERAGE DISCHARGE.--15 years, 92.3 cfs (11.19 inches per year).

EXTREMES.--Current year: Maximum discharge, 1,150 cfs Apr. 28 (gage height, 15.68 ft); minimum, 11 cfs Aug. 3, 10, 11; minimum gage height, 3.01 ft Aug. 10.

Period of record: Maximum discharge, 1,950 cfs Apr. 12, 1969 (gage height, 19.27 ft); maximum gage height, 19.61 ft Apr. 11, 1969 (backwater from ice); minimum discharge, 11 cfs Aug. 3, 10, 11, 1970; minimum gage height, 3.01 ft Aug. 10, 1970.

Flood in May 1950 reached a stage of about 20.0 ft, from information by local residents.

REMARKS.--Records good except those for winter months, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	75	98	52	33	34	52	74	661	253	39	14	29
2	84	147	53	32	35	51	72	544	229	38	13	31
3	77	145	53	31	38	50	72	455	178	37	12	32
4	72	125	50	30	40	50	74	379	122	39	12	25
5	68	110	46	29	45	49	78	327	110	32	13	28
6	67	99	45	28	48	48	90	283	91	29	13	28
7	67	98	44	27	51	48	210	246	77	30	12	29
8	63	89	43	26	52	48	500	229	68	45	13	33
9	57	81	43	26	52	48	645	237	62	39	12	32
10	54	76	42	25	52	48	660	252	71	34	12	33
11	57	74	42	25	52	48	550	242	105	31	12	30
12	60	72	42	24	50	48	430	226	115	30	18	25
13	61	62	41	24	50	49	325	206	87	29	21	24
14	63	53	40	23	48	50	305	181	71	29	20	25
15	63	62	40	23	47	51	290	186	67	35	25	29
16	60	62	40	23	47	52	280	224	70	34	24	35
17	52	60	39	23	47	54	282	207	71	29	22	33
18	48	56	39	23	48	56	261	174	64	29	23	27
19	43	52	38	24	48	58	237	147	56	43	24	28
20	38	50	38	24	49	61	178	130	51	42	24	30
21	37	49	38	24	51	67	184	147	48	35	24	30
22	36	48	37	25	52	78	202	151	49	31	25	34
23	30	47	37	25	53	84	226	136	47	28	29	34
24	33	47	37	25	54	87	343	128	43	25	28	39
25	36	47	36	26	54	89	601	137	42	25	28	38
26	45	47	35	26	53	90	863	142	47	24	28	31
27	52	48	35	27	52	89	1,060	133	46	23	28	31
28	48	48	35	28	52	86	1,140	119	44	23	27	29
29	44	49	34	29	------	84	1,080	124	42	17	28	30
30	46	50	34	30	------	80	834	245	41	16	28	32
31	56	------	33	32	------	76	------	258	------	15	29	------
TOTAL	1,692	2,151	1,261	820	1,354	1,929	12,146	7,256	2,467	955	641	914
MEAN	54.6	71.7	40.7	26.5	48.4	62.2	405	234	82.2	30.8	20.7	30.5
MAX	84	147	53	33	54	90	1,140	661	253	45	29	39
MIN	30	47	33	23	34	48	72	119	41	15	12	24
CFSM	.49	.64	.36	.24	.43	.56	3.62	2.09	.73	.26	.18	.27
IN.	.56	.71	.42	.27	.45	.64	4.03	2.41	.82	.32	.21	.30

CAL YR 1969 TOTAL 38,640 MEAN 106 MAX 1,930 MIN 21 CFSM .95 IN 12.83
WTR YR 1970 TOTAL 33,586 MEAN 92.0 MAX 1,140 MIN 12 CFSM .82 IN 11.16

PEAK DISCHARGE (BASE, 400 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
4-9	2315	14.81	666	4-28	2145	15.68	1,150

04024000 St. Louis River at Scanlon, Minn.

LOCATION.--Lat 46°42'12", long 92°25'07", in NW¼ sec.30, T.49 N., R.16 W., St. Louis County, on right bank 25 ft downstream from lower bridge on U.S. Highway 61 at Scanlon, 0.6 mile downstream from Minnesota Power & Light Co. powerplant, 3 miles upstream from Thomson Reservoir, and 3.2 miles upstream from Midway River.

DRAINAGE AREA.--3,430 sq mi, approximately.

PERIOD OF RECORD.--January 1908 to current year. Monthly discharge only for some periods published in WSP 1307. Published as "near Thomson" 1908-50.

GAGE.--Water-stage recorder. Datum of gage is 1,101.23 ft above mean sea level, datum of 1929. Oct. 5, 1909, to Sept. 5, 1914, nonrecording gage 3 miles downstream and 50 ft below powerplant at datum about 420 ft lower. Sept. 6, 1914, to Aug. 4, 1953, powerplant record at Thomson hydroelectric plant.

AVERAGE DISCHARGE (UNADJUSTED).--62 years, 2,221 cfs (8.79 inches per year).

EXTREMES.--Current year: Maximum discharge, 15,500 cfs Apr. 30 (gage height, 9.12 ft); minimum, 502 cfs Sept. 28 (gage height, 2.52 ft).
Period of record: Maximum daily discharge, 37,900 cfs May 9, 1950; maximum gage height, 15.8 ft, May 9, 1950, from Minnesota Highway Department (discharge uncertain); minimum discharge, 80 cfs Aug. 29, 1963; minimum daily, 109 cfs Feb. 7, 1924.

REMARKS.--Records good. Diurnal fluctuation caused by powerplant upstream. Flow regulated by Whiteface Reservoir and Boulder, Island, Rice and Fish Lakes (combined capacity, 332,160 acre-ft). Records of chemical analyses for the water year 1970 are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 1337: 1911-12.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1,580	1,780	1,660	1,620	1,320	1,300	1,510	14,600	5,400	1,140	1,010	869
2	1,670	2,270	1,710	1,600	1,250	1,270	1,520	13,300	5,070	970	962	869
3	1,670	2,810	1,640	1,570	1,330	1,330	1,340	11,800	4,620	885	945	877
4	1,610	2,880	1,520	1,530	1,190	1,360	1,240	10,500	4,180	1,020	945	911
5	1,560	2,690	1,560	1,470	1,230	1,320	1,280	9,390	3,610	1,010	894	869
6	1,480	2,440	1,600	1,440	1,270	1,340	1,310	8,380	3,260	1,030	894	894
7	1,380	2,560	1,610	1,430	1,350	1,450	1,520	7,430	2,680	1,100	861	928
8	1,330	2,310	1,530	1,360	1,390	1,490	3,750	6,920	2,400	1,110	894	869
9	1,250	2,170	1,570	1,420	1,280	1,520	6,950	6,490	2,090	1,040	894	885
10	1,200	1,930	1,530	1,450	1,240	1,460	7,530	6,230	1,740	902	861	902
11	1,110	1,870	1,570	1,470	1,340	1,480	7,400	5,930	1,590	861	885	911
12	1,120	1,700	1,560	1,390	1,310	1,520	6,940	5,580	1,790	962	911	911
13	1,100	1,620	1,690	1,460	1,270	1,540	6,640	5,040	1,990	970	945	877
14	1,270	1,580	1,680	1,360	1,240	1,540	6,570	4,660	1,960	997	911	902
15	1,380	1,290	1,630	1,400	1,200	1,590	6,580	4,470	1,960	962	962	894
16	1,290	1,190	1,610	1,310	1,250	1,620	6,050	4,330	1,850	979	970	970
17	1,300	1,440	1,680	1,400	1,300	1,690	5,890	4,290	1,880	928	928	945
18	1,390	1,610	1,710	1,380	1,280	1,650	5,470	4,010	1,850	997	919	877
19	1,380	1,240	1,730	1,350	1,300	1,640	5,050	3,630	1,760	1,290	928	861
20	1,280	1,310	1,650	1,240	1,340	1,640	4,810	3,430	1,570	1,300	953	869
21	1,300	1,510	1,700	1,200	1,300	1,540	4,330	3,710	1,550	1,270	861	837
22	1,280	1,340	1,600	1,280	1,270	1,460	4,310	3,770	1,400	1,050	894	861
23	1,260	1,570	1,640	1,210	1,300	1,470	4,760	3,760	1,310	902	869	813
24	1,210	1,690	1,620	1,320	1,340	1,610	6,260	3,540	1,170	945	869	768
25	1,240	1,590	1,630	1,370	1,330	1,650	11,500	3,650	945	919	877	845
26	1,300	1,680	1,550	1,310	1,350	1,730	14,700	3,730	1,150	936	885	837
27	1,380	1,540	1,650	1,280	1,340	1,760	14,700	3,770	1,130	962	877	821
28	1,440	1,570	1,640	1,380	1,330	1,770	15,100	3,710	1,150	1,020	869	753
29	1,450	1,650	1,640	1,290	------	1,760	15,200	3,610	1,280	988	861	845
30	1,390	1,570	1,610	1,400	------	1,690	15,300	4,280	1,130	979	845	738
31	1,590	------	1,580	1,360	------	1,710	------	5,450	------	1,110	869	------
TOTAL	42,190	54,400	50,300	43,040	36,240	47,900	195,510	183,390	65,465	31,534	28,048	26,008
MEAN	1,361	1,813	1,623	1,388	1,294	1,545	6,517	5,916	2,182	1,017	905	867
MAX	1,670	2,880	1,730	1,620	1,390	1,770	15,300	14,600	5,400	1,300	1,010	970
MIN	1,100	1,190	1,520	1,200	1,190	1,270	1,240	3,430	945	861	845	738
(ƒ)	+156	+134	-892	-921	-777	-935	+1,622	+1,712	+289	-638	-693	-490
MEAN ≠	1,517	1,947	731	467	517	610	8,139	7,628	2,471	379	212	377
CFSM ≠	0.44	0.57	0.21	0.14	0.15	0.18	2.37	2.22	0.72	0.11	0.06	0.11
IN. ≠	0.51	0.63	0.25	0.16	0.16	0.21	2.65	2.56	0.80	0.13	0.07	0.12

CAL YR 1969	MAX	28,100	MIN	923	MEAN	2,942	MEAN ≠	2,909	CFSM ≠	0.86	IN. ≠	11.51
WTR YR 1970	MAX	15,300	MIN	738	MEAN	2,203	MEAN ≠	2,083	CFSM ≠	0.60	IN. ≠	8.16

ƒ Change in contents, equivalent in cubic feet per second, in Whiteface Reservoir and Boulder, Island, Rice and Fish Lakes; records furnished by Minnesota Power and Light Co.
≠ Adjusted for change in contents.

05030000 Otter Tail River near Detroit Lakes, Minn.

LOCATION.--Lat 46°50'12", long 95°41'57", in NE¼SW¼ sec.23, T.139 N., R.40 W., Becker County, on right bank 10 ft upstream from highway bridge, 5 miles downstream from Height of Land Lake, and 7.5 miles east of city of Detroit Lakes.

DRAINAGE AREA.--270 sq mi.

PERIOD OF RECORD.--March 1937 to current year.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 1,409.49 ft above mean sea level, datum of 1929.

AVERAGE DISCHARGE.--33 years, 54.4 cfs (39,410 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 182 cfs June 16 (gage height, 4.21 ft); maximum gage height 5.07 ft about Jan. 20 (backwater from ice); minimum discharge, 0.35 cfs Sept. 5, 6 (gage height, 2.59 ft).
Period of record: Maximum discharge, 371 cfs June 26, 1943 (gage height, 4.78 ft, from graph based on partial record); maximum gage height, 6.96 ft Jan. 27, 1950 (backwater from ice); minimum daily discharge, 0.1 cfs Mar. 23, 1940.

REMARKS.--Records good except those for winter periods, which are fair. Flow partly regulated by dams of Minnesota Department of Conservation on several lakes above station.

REVISIONS (WATER YEAR).--WSP 1308: 1944(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.8	5.3	16	23	33	35	34	115	129	141	30	.98
2	6.5	12	15	24	33	35	34	117	129	139	28	.98
3	6.2	35	14	24	33	38	34	123	129	135	25	.82
4	7.2	42	14	25	33	36	36	127	129	135	23	.82
5	14	31	15	25	33	36	38	131	129	131	21	.56
6	12	18	15	25	33	36	38	131	127	129	16	.50
7	11	19	16	26	33	36	46	135	127	119	12	.50
8	9.7	20	18	27	33	36	47	139	123	115	13	.50
9	9.7	20	18	27	33	35	44	141	137	115	12	.50
10	8.9	19	18	27	33	35	40	145	139	115	12	.50
11	9.3	19	18	27	33	35	39	147	135	113	11	.50
12	8.6	18	18	27	33	34	39	147	137	113	9.3	.50
13	7.8	18	18	27	33	34	40	145	137	113	9.0	.50
14	7.5	18	17	27	33	34	43	147	129	109	9.3	.50
15	11	18	18	28	33	34	49	149	151	109	8.6	.82
16	20	18	18	29	33	34	53	149	166	105	6.8	.66
17	30	18	18	30	34	34	60	147	154	91	5.4	.66
18	29	18	19	30	34	34	62	147	147	89	4.0	.66
19	28	18	19	31	34	34	76	147	151	91	3.8	.50
20	46	18	19	31	34	34	82	145	159	89	3.3	3.5
21	62	18	19	32	34	34	89	139	154	82	3.0	5.6
22	78	18	19	32	35	34	89	135	151	76	2.8	2.1
23	63	18	19	32	35	34	91	129	147	71	2.6	2.7
24	18	17	20	32	35	34	95	125	145	65	2.1	2.7
25	2.6	17	20	32	35	34	98	119	147	60	1.9	2.7
26	1.8	16	20	32	35	34	98	115	151	56	1.8	2.5
27	1.5	16	20	32	35	34	107	113	149	48	1.6	2.2
28	1.1	16	21	32	35	34	111	113	147	43	1.5	2.0
29	1.1	15	21	32	------	34	111	113	145	42	1.9	2.0
30	1.1	16	21	32	------	34	109	115	143	42	1.3	1.9
31	1.5	------	22	32	------	34	------	117	------	37	1.1	------
TOTAL	520.9	569.3	563	892	943	1,073	1,932	4,107	4,243	2,918	284.1	41.86
MEAN	16.8	19.0	18.2	28.8	33.7	34.6	64.4	132	141	94.1	9.16	1.40
MAX	78	42	22	32	35	38	111	149	166	141	30	5.6
MIN	1.1	5.3	14	23	33	34	34	113	123	37	1.1	.50
AC-FT	1,030	1,130	1,120	1,770	1,870	2,130	3,830	8,150	8,420	5,790	564	83

CAL YR 1969 TOTAL 18,516.70 MEAN 50.7 MAX 204 MIN 1.1 ACFT 36,730
WAT YR 1970 TOTAL 18,087.16 MEAN 49.6 MAX 166 MIN .50 ACFT 35,880

05033900 Pelican River at Detroit Lakes, Minn.

LOCATION.--Lat 46°48'37", long 95°49'42", in SW¼ sec.35, T.139 N., R.41 W., Becker County, on left bank 60 ft upstream from culvert, 0.5 mile upstream from Detroit Lake, at Detroit Lakes.

PERIOD OF RECORD.--July 1968 to current year.

GAGE.--Nonrecording gage read once daily. Datum of gage is 1334.73 ft above mean sea level, datum of 1929 (levels by Winston Larson, Detroit Lakes city engineer).

EXTREMES.--Current year: Maximum discharge, 55 cfs Apr. 29 (gage height, 3.16 ft; minimum daily, 0.4 cfs Oct. 2, 3.

Period of record: Maximum discharge, 167 cfs Apr. 10, 1969 (gage height, 5.31 ft, from floodmark); minimum daily, 0.3 cfs Sept. 28-30, 1969.

REMARKS.--Records fair. Records of chemical analyses for the current year are published in Part 2 of this report.

COOPERATION.--Gage-height record furnished by Pelican River Watershed District.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.50	2.6	1.8	1.0	1.5	1.6	2.9	49	36	17	3.0	1.2
2	.40	2.7	1.8	1.0	1.5	1.6	3.0	45	34	16	2.7	1.2
3	.40	2.6	1.7	1.0	1.5	2.0	3.3	42	32	15	2.4	1.4
4	.60	2.6	1.6	1.0	1.5	1.6	3.6	38	28	14	2.1	1.2
5	1.9	3.3	1.5	1.0	1.5	1.6	4.0	35	25	13	2.1	1.0
6	1.9	3.0	1.4	1.1	1.5	1.6	4.6	33	23	12	2.1	1.0
7	1.0	3.0	1.3	1.1	1.5	1.6	7.8	30	21	12	1.8	1.0
8	1.0	2.9	1.2	1.1	1.5	1.6	34	30	21	11	1.8	1.0
9	1.1	2.9	1.1	1.1	1.5	1.6	25	29	22	10	1.8	1.0
10	1.4	2.9	1.0	1.1	1.5	1.6	46	29	22	9.0	2.1	.80
11	1.3	2.9	.90	1.2	1.5	1.6	44	29	25	7.7	2.1	.80
12	1.2	2.8	.80	1.2	1.5	1.6	41	28	24	12	2.1	.60
13	1.2	2.7	.80	1.2	1.5	1.6	36	28	22	7.7	2.1	.60
14	1.2	2.7	.70	1.2	1.5	1.6	30	27	23	7.2	2.1	.60
15	1.2	2.6	.70	1.2	1.5	1.7	26	26	43	7.2	1.8	3.0
16	1.1	2.6	.70	1.3	1.5	1.7	27	25	46	7.2	1.8	1.4
17	1.1	2.5	.70	1.3	1.5	1.8	25	26	42	6.8	1.6	2.1
18	1.3	2.5	.70	1.3	1.5	1.8	23	26	37	5.9	1.8	1.6
19	1.2	2.4	.70	1.4	1.6	1.9	23	26	33	5.5	2.1	1.2
20	1.2	2.4	.80	1.4	1.6	1.9	24	25	30	5.5	1.8	1.2
21	1.3	2.3	.80	1.4	1.6	2.0	25	23	26	5.1	1.8	12
22	1.3	2.3	.80	1.4	1.6	2.0	28	23	24	4.3	1.6	4.0
23	1.2	2.2	.80	1.4	1.6	2.1	30	23	23	4.0	1.6	3.0
24	1.3	2.2	.80	1.4	1.6	2.1	40	23	22	3.6	1.6	2.4
25	1.4	2.1	.80	1.4	1.6	2.2	50	25	21	3.3	1.6	2.1
26	1.4	2.1	.90	1.5	1.6	2.3	48	25	20	3.0	1.4	1.8
27	1.8	2.0	.90	1.5	1.6	2.4	51	24	19	2.7	1.4	1.8
28	1.7	2.0	.90	1.5	1.6	2.5	55	24	19	2.4	1.4	1.6
29	1.6	1.9	.90	1.5	------	2.6	55	25	18	4.3	1.4	1.6
30	2.0	1.9	.90	1.5	------	2.7	52	25	18	3.3	1.4	2.1
31	2.3	------	.90	1.5	------	2.8	------	25	------	3.3	1.2	------
TOTAL	39.50	75.6	31.30	39.2	43.0	59.3	867.2	891	799	241.0	57.6	56.30
MEAN	1.27	2.52	1.01	1.26	1.54	1.91	28.9	28.7	26.6	7.77	1.86	1.88
MAX	2.3	3.3	1.8	1.5	1.6	2.8	55	49	46	17	3.0	12
MIN	.40	1.9	.70	1.0	1.5	1.6	2.9	23	18	2.4	1.2	.60
AC-FT	78	150	62	78	85	118	1,720	1,770	1,580	478	114	112

CAL YR 1969 TOTAL 3,778.50 MEAN 10.4 MAX 158 MIN .30 ACFT 7,490
WAT YR 1970 TOTAL 3,200.00 MEAN 8.77 MAX 55 MIN .40 ACFT 6,350

05034100 Pelican River at Detroit Lake Outlet near Detroit Lakes, Minn.

LOCATION.--Lat 46°47'22", long 95°52'00", on line between secs. 4 and 9, T.138 N., R.41 W., Becker County, on left wingwall of remains of old dam at outlet of Detroit Lake, 60 ft upstream from bridge on County Highway 22 and 2.5 miles southwest of Detroit Lakes.

PERIOD OF RECORD.--July 1968 to current year.

GAGE.--Nonrecording gage read once daily. Datum of gage is 1,330.01 ft above mean sea level, datum of 1929.

EXTREMES.--Current year: Maximum daily discharge, 73 cfs May 3-5; maximum gage height, 4.59 ft Apr. 29; minimum discharge, -4.6 cfs Oct. 9.
Period of record: Maximum discharge, 111 cfs Apr. 17, 1969 (gage height, 4.55 ft); minimum discharge -4.5 cfs Oct. 9, 1969.

REMARKS.--Records fair.

COOPERATION.--Gage readings furnished by Pelican River Watershed District.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	0	8.2	8.7	8.2	3.8	9.5	72	48	33	.40	
2	0	0	8.2	8.8	8.1	3.8	8.5	72	49	29	.30	
3	0	.50	8.2	8.8	8.0	4.0	6.5	73	49	23	0	
4	0	1.0	8.2	8.9	7.8	4.2	4.2	73	46	22	0	
5	-.60	1.5	8.1	8.9	7.6	4.4	2.9	73	42	21	0	
6	-1.2	2.0	8.1	9.0	7.5	4.6	2.0	72	40	20	0	
7	-2.4	2.5	8.2	9.1	7.4	4.8	1.6	70	38	18	0	
8	-4.5	3.0	8.2	9.2	7.0	5.0	1.0	68	35	17	0	
9	-4.6	3.5	8.2	9.2	6.5	5.1	.10	66	37	16	-.10	
10	-4.0	4.0	8.1	9.2	6.3	5.2	0	64	36	15	-.50	
11	-3.8	4.5	8.1	9.3	6.2	5.3	0	62	36	15	-.60	
12	-3.5	5.4	8.1	9.3	6.1	5.4	0	61	35	16	-.60	
13	-3.5	5.4	8.1	9.4	6.0	5.4	0	56	35	16	-.60	
14	-3.4	5.5	8.1	9.5	5.9	5.5	0	55	34	14	-.60	
15	-3.1	5.4	8.1	9.5	5.8	5.6	0	53	34	14	-.70	
16	-2.5	5.6	8.2	9.6	5.7	5.6	0	53	44	12	-.80	
17	-2.5	6.0	8.2	9.7	5.7	5.7	0	52	44	11	-.90	
18	-2.5	6.4	8.2	9.7	5.6	5.8	0	50	42	10	-1.0	
19	-2.5	6.8	8.2	9.8	5.3	5.9	0	50	42	9.8	-1.0	
20	-2.5	7.1	8.2	9.8	4.9	6.0	0	48	44	8.5	-1.0	
21	-2.5	7.3	8.2	9.8	4.8	6.0	2.0	47	42	5.9	-1.0	
22	-2.3	7.6	8.2	9.8	4.6	6.0	5.2	46	44	4.8	-1.0	
23	-2.0	7.7	8.1	9.8	4.4	6.1	17	45	42	3.0	-1.0	
24	-2.0	7.9	8.2	9.7	4.0	6.2	30	45	43	.90	-1.0	
25	-2.0	8.0	8.3	9.1	3.8	6.3	54	44	42	.60	-1.0	
26	-2.0	8.0	8.4	8.8	3.8	6.6	60	43	43	.60	-1.0	
27	-2.0	8.1	8.4	8.5	3.8	7.2	64	42	43	.40	-1.0	
28	-2.0	8.2	8.5	8.3	3.8	7.9	66	41	40	.40	-.90	
29	-2.0	8.2	8.6	8.2	------	8.6	67	41	37	.70	0	
30	0	8.2	8.6	8.2	------	9.1	70	42	33	.40	0	
31	0	------	8.7	8.2	------	9.5	------	42	------	.50	0	------
TOTAL	-65.90	155.30	255.4	283.8	164.6	180.6	471.50	1,721	1,219	358.50	-15.60	0
MEAN	-2.13	5.18	8.24	9.15	5.88	5.83	15.7	55.5	40.6	11.6	-.50	0
MAX	0	8.2	8.7	9.8	8.2	9.5	70	73	49	33	.40	0
MIN	-4.6	0	8.1	8.2	3.8	3.8	0	41	33	.40	-1.0	0
AC-FT	-131	308	507	563	326	358	935	3,410	2,420	711	-31	0

CAL YR 1969 TOTAL 5,473.00 MEAN 15.0 MAX 110 MIN -4.6 ACFT 10,860
WAT YR 1970 TOTAL 4,728.20 MEAN 13.0 MAX 73 MIN -4.6 ACFT 9,380

05035100 Long Lake Outlet near Detroit Lakes, Minn.

LOCATION.--Lat 46°48'33", long 95°53'26", in SE¼ sec.32, T.139 N., R.41 W., Becker County, on right downstream wingwall of abandoned Minnesota Conservation Department dam, 200 ft downstream from Long Lake, 2,500 ft upstream from St. Clair Lake and 2.2 miles west of Detroit Lakes.

PERIOD OF RECORD.--July 1968 to current year.

GAGE.--Nonrecording gage read once daily. Altitude of gage is 1,350 ft (from topographic map).

EXTREMES.--Current year: Maximum discharge, 6.0 cfs June 16 (gage height, 3.92 ft); maximum gage height, 4.81 ft Jan. 6 (backwater from ice); no flow for many days.
Period of record: Maximum discharge, 6.9 cfs Apr. 13, 1969 (gage height, 3.97 ft); maximum gage height, 4.81 ft Jan. 6, 1970 (backwater from ice); no flow for several days in most years.

REMARKS.--Records good. Flow affected by natural storage in Long Lake.

COOPERATION.--Gage-height record furnished by Pelican River Watershed District.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1			0	.20	2.1	1.5	2.0	3.9	4.1	4.1	.80	0
2			0	.20	2.1	1.5	2.0	3.7	3.8	4.1	.80	0
3			.10	.20	2.0	1.5	2.1	3.7	3.7	3.7	.70	0
4			.20	.30	2.0	1.5	2.1	3.5	3.7	3.5	.70	0
5			.30	.60	2.0	1.5	2.1	3.3	3.5	3.5	.50	0
6			.30	.80	1.9	1.5	2.2	3.1	3.3	3.3	.50	0
7			.30	1.2	1.9	1.5	2.2	3.1	3.3	2.9	.50	0
8			.30	1.5	1.8	1.5	2.2	3.1	3.3	2.9	.40	0
9			.30	1.8	1.8	1.5	2.4	3.1	3.1	2.7	.40	0
10			.20	2.0	1.8	1.5	2.4	3.3	3.1	2.5	.40	0
11			.20	2.2	1.7	1.5	2.4	3.9	3.1	2.5	.40	0
12			.10	2.3	1.7	1.5	2.5	3.7	3.3	2.9	.40	0
13			.10	2.4	1.7	1.5	2.5	3.9	3.5	2.5	.30	0
14			.10	2.4	1.6	1.5	2.5	3.9	3.8	2.5	.20	0
15			0	2.4	1.6	1.6	2.5	3.7	5.2	2.5	.20	0
16			0	2.4	1.6	1.6	2.9	3.7	6.0	2.4	.20	0
17			0	2.5	1.6	1.6	3.1	3.7	5.8	2.4	.20	0
18			0	2.5	1.5	1.6	3.3	3.7	5.0	2.2	.10	0
19			0	2.5	1.5	1.6	3.7	3.5	4.6	2.0	0	0
20			0	2.5	1.5	1.7	4.2	3.5	4.2	2.0	0	0
21			0	2.5	1.5	1.7	4.1	3.5	4.1	1.6	0	.10
22			0	2.5	1.5	1.7	4.1	3.5	4.1	1.4	0	0
23			0	2.4	1.5	1.7	4.1	3.5	4.1	1.2	0	0
24			0	2.4	1.5	1.7	4.2	3.7	4.2	1.0	0	0
25			0	2.4	1.5	1.8	4.2	3.7	3.9	.80	0	0
26			0	2.3	1.5	1.8	4.2	3.5	4.1	.70	0	0
27			0	2.3	1.5	1.8	4.6	3.3	4.2	.70	0	0
28			.10	2.3	1.5	1.8	5.0	3.3	4.1	.70	0	0
29			.10	2.2	------	1.9	5.0	3.3	4.2	1.0	0	0
30			.10	2.2	------	1.9	4.4	3.5	4.1	.80	0	0
31		------	.10	2.1	------	1.9	------	4.1	------	1.0	0	------
TOTAL	0	0	2.90	58.50	47.4	50.4	95.2	109.9	120.5	68.00	7.70	.10
MEAN	0	0	.094	1.89	1.69	1.63	3.17	3.55	4.02	2.19	.25	.003
MAX	0	0	.30	2.5	2.1	1.9	5.0	4.1	6.0	4.1	.80	.10
MIN	0	0	0	.20	1.5	1.5	2.0	3.1	3.1	.70	0	0
AC-FT	0	0	5.8	116	94	100	189	218	239	135	15	.2

CAL YR 1969 TOTAL 566.30 MEAN 1.55 MAX 6.9 MIN 0 ACFT 1,120
WAT YR 1970 TOTAL 560.60 MEAN 1.54 MAX 6.0 MIN 0 ACFT 1,110

05035200 West Branch County Ditch No. 14 near Detroit Lakes, Minn.

LOCATION.--Lat 46°48'48", long 95°52'20", in NW¼ sec.33, T.139 N., R.41 W., Becker County, 1,700 ft upstream from East Branch County Ditch No. 14, 1,900 ft upstream from St. Clair Lake and 1.5 miles west of Detroit Lakes.

PERIOD OF RECORD.--July 1968 to current year.

GAGE.--Nonrecording gage read once-daily.

EXTREMES.--Current year: Maximum discharge, 5.0 cfs Apr. 12 (gage height, 3.80 ft, backwater from ice); maximum gage height, 4.62 ft Apr. 7 (backwater from ice); no flow for many days.
Period of record: Maximum discharge, 16 cfs Apr. 10, 1969 (gage height, 5.45 ft, backwater from ice); maximum gage height, 5.61 ft Apr. 9, 1969 (backwater from ice); no flow for several days during most years.

REMARKS.--Records poor.

COOPERATION.--Gage-height record furnished by Pelican River Watershed District.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.40	.30	.10			0	.30	2.8	2.6	.80	.10	0
2	.50	.30	.10			0	.30	2.6	2.3	.60	.10	0
3	.30	.30	.10			0	.40	2.6	2.0	.50	0	0
4	.30	.30	.10			0	.50	2.2	1.7	.50	0	.10
5	.80	.30	.10			0	.70	1.9	1.6	.40	0	.10
6	.50	.30	.10			0	1.0	1.7	1.5	.40	0	.10
7	.50	.20	.10			0	1.5	1.5	1.4	.40	0	.10
8	.50	.20	.10			0	2.2	1.2	1.5	.40	0	.10
9	.40	.20	.10			0	3.0	1.2	1.6	.40	0	.10
10	.50	.20	.10			0	4.0	1.2	1.8	.30	0	.10
11	.50	.20	.10			0	4.5	1.2	1.7	.30	0	.10
12	.50	.20	.10			0	5.0	1.2	1.7	.40	0	.10
13	.50	.20	.10			0	3.5	1.1	2.0	.30	0	.10
14	.70	.20	.10			0	1.9	1.2	3.0	.30	0	.10
15	.70	.20	.10			0	1.7	1.3	4.0	.50	0	.10
16	.20	.20	.10			0	1.7	1.4	4.8	.40	0	.10
17	.20	.20	.10			0	1.4	1.2	3.8	.40	0	.10
18	.20	.20	.10			0	1.2	1.1	3.1	.30	0	.10
19	.20	.20	.10			0	1.3	1.0	2.4	.30	0	.10
20	.20	.20	.10			0	.90	1.0	2.2	.20	0	.10
21	.20	.20	.10			0	1.0	.90	2.2	.20	0	1.2
22	.20	.20	.10			.10	1.4	.90	2.1	.20	0	.50
23	.20	.20	.10			.10	1.6	.90	1.5	.20	0	.50
24	.10	.20	0			.10	2.7	1.0	1.3	.10	0	.40
25	.10	.20	0			.10	3.2	1.0	1.0	.10	0	.40
26	.10	.20	0			.10	2.8	1.0	1.1	.10	0	.40
27	.10	.20	0			.10	3.2	1.0	1.3	.10	0	.30
28	.10	.20	0			.10	3.4	1.0	1.3	.10	0	.30
29	.10	.10	0		------	.20	3.3	1.1	1.1	.10	0	.30
30	.20	.10	0		------	.20	3.0	1.2	1.0	.10	0	.20
31	.20	------	0		------	.20	------	2.6	------	.10	0	------
TOTAL	10.20	6.40	2.30	0	0	1.30	62.60	43.20	60.6	9.50	.20	6.20
MEAN	.33	.21	.074	0	0	.042	2.09	1.39	2.02	.31	.006	.21
MAX	.80	.30	.10	0	0	.20	5.0	2.8	4.8	.80	.10	1.2
MIN	.10	.10	0	0	0	0	.30	.90	1.0	.10	0	0
AC-FT	20	13	4.6	0	0	2.6	124	86	120	19	.4	12

CAL YR 1969 TOTAL 191.60 MEAN .52 MAX 14 MIN 0 ACFT 380
WAT YR 1970 TOTAL 202.50 MEAN .55 MAX 5.0 MIN 0 ACFT 402

05035300 East Branch County Ditch No. 14 near Detroit Lakes, Minn.

LOCATION.--Lat 46°48'35", long 95°52'23", in SW¼ sec.33, T.139 N. R.41 W., Becker County, on left bank near downstream end of culvert on U. S. Highway 59, approximately 1,000 ft upstream from St. Clair Lake, and 1.5 miles west of city of Detroit Lakes.

PERIOD RECORD.--July 1968 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,333.96 ft above mean sea level, datum of 1929.

EXTREMES.--Current year: Maximum discharge, 6.9 cfs Apr. 8 (gage height, 2.53 ft); maximum gage height, 2.69 ft Oct. 1; minimum daily discharge, 0.31 cfs Aug. 7.
Period of record: Maximum discharge, 6.9 cfs Apr. 8, 1970 (gage height, 2.53 ft); maximum gage height, 2.90 ft July 20, 1968; no flow Aug. 21, 1969.

REMARKS.--Records poor.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.8	.81	.72	.56	.54	.69	1.3	3.2	2.3	2.4	1.0	.43
2	2.8	.74	.72	.56	.54	.70	1.5	2.8	2.0	2.4	.89	.48
3	3.0	.70	.72	.56	.55	.70	1.7	2.4	2.0	2.3	.76	.49
4	2.6	.67	.72	.56	.55	.70	2.1	2.0	1.9	2.3	.72	.51
5	2.2	.68	.72	.56	.56	.70	3.2	1.7	1.8	2.3	.68	.54
6	2.3	.71	.73	.55	.56	.70	3.6	1.7	1.7	2.4	.64	.55
7	2.3	.73	.75	.55	.57	.71	4.8	1.7	1.6	2.4	.62	.54
8	2.9	.74	.77	.54	.57	.71	5.8	1.7	1.5	2.3	.61	.55
9	3.6	.75	.78	.54	.58	.71	5.1	1.7	1.6	2.4	.57	.56
10	3.6	.74	.78	.54	.58	.71	5.0	1.8	1.6	2.4	.52	.54
11	3.1	.73	.84	.53	.59	.71	4.9	1.8	1.8	2.4	.52	.63
12	2.8	.72	.77	.53	.59	.71	4.8	1.8	1.6	2.6	.49	68
13	2.7	.70	.76	.53	.59	.71	4.6	1.7	1.6	2.7	.45	69
14	2.6	.68	.77	.53	.60	.71	4.4	1.7	1.6	2.8	.42	77
15	2.4	.69	.75	.52	.60	.71	4.6	1.9	2.4	3.1	.40	.98
16	2.3	.69	.73	.52	.61	.72	4.6	1.8	2.5	2.9	.36	.90
17	2.2	.71	.70	.52	.61	.73	4.3	1.8	2.3	2.7	.31	.99
18	2.1	.70	.69	.52	.62	.74	4.1	1.7	2.2	2.5	.35	.99
19	2.0	.70	.67	.51	.62	.76	4.3	1.6	2.0	2.3	.34	1.1
20	1.9	.70	.66	.51	.63	.78	4.3	1.6	2.2	2.1	.34	1.4
21	1.8	.70	.65	.51	.63	.79	4.5	1.6	2.1	2.0	.35	3.5
22	1.7	.71	.64	.51	.64	.80	4.5	1.6	2.0	1.9	.36	2.5
23	1.6	.69	.63	.51	.65	.81	4.8	1.6	2.0	1.7	.34	1.[illegible]
24	1.5	.70	.62	.51	.66	.82	5.0	1.6	1.8	1.6	.33	1.[illegible]
25	1.4	.72	.61	.52	.66	.83	4.9	1.7	1.9	1.5	.40	1.[illegible]
26	1.7	.71	.61	.52	.67	.86	4.6	1.6	2.5	1.3	.38	1.5
27	1.4	.72	.60	.52	.67	.87	4.7	1.5	2.5	1.2	.38	1.4
28	1.2	.72	.59	.52	.68	.88	5.0	1.5	2.5	1.2	.38	1.3
29	1.1	.72	.58	.53	------	.91	4.3	1.8	2.4	1.2	.40	1.3
30	.97	.72	.57	.53	------	.93	3.8	1.6	2.5	1.1	.42	1.3
31	.68	------	.57	.53	------	1.1	------	2.4	------	1.1	.37	------
TOTAL	66.25	21.40	21.42	16.45	16.92	23.91	125.1	56.6	60.4	65.5	15.10	32.32
MEAN	2.14	.71	.69	.53	.60	.77	4.17	1.83	2.01	2.11	.49	1.08
MAX	3.6	.81	.84	.56	.68	1.1	5.8	3.2	2.5	3.1	1.0	3.5
MIN	.68	.67	.57	.51	.54	.69	1.3	1.5	1.5	1.1	.31	.43
AC-FT	131	42	42	33	34	47	248	112	120	130	30	64

CAL YR 1969 TOTAL 389.73 MEAN 1.07 MAX 4.2 MIN 0 AC-FT 773
WTR YR 1970 TOTAL 521.37 MEAN 1.43 MAX 5.8 MIN .31 AC-FT 1,030

05035400 St. Clair Lake near Detroit Lakes, Minn.

LOCATION.--Lat 46°47'52", long 95°52'49", in NE¼ sec.5, T.138 N., R.41 W., Becker County, at south end of lake, 2,000 ft south at St. Clair Lake outlet and 2.2 miles southwest of Detroit Lakes.

PERIOD OF RECORD.--July 1968 to current year.

GAGE.--Nonrecording gage read once daily. Datum of gage is 1,330.653 ft above mean sea level, datum of 1929 (Minnesota Highway Department benchmark).

EXTREMES.--Current year: Maximum gage height observed, 5.63 ft Apr. 29; minimum observed, 4.26 ft Sept. 12. Period of record: Maximum gage height observed, 5.95 ft Apr. 17, 1969; minimum observed, 4.22 ft Sept. 15, 1968.

REMARKS.--Water level subject to fluctuation caused by wind action.

COOPERATION.--Gage reading furnished by Pelican River Watershed District.

GAGE HEIGHT, IN FEET, OCTOBER 1969 TO SEPTEMBER 1970

Oct. 31	4.61	Mar. 31	5.01	June 30	5.53
Nov. 30	5.00	Apr. 30	5.60	July 31	5.14
Dec. 16	5.15	May 31	5.16	Aug. 31	4.48
				Sept. 30	4.65

NOTE.--Gage-height record other than that shown above is available.

05035500 St. Clair Lake Outlet near Detroit Lakes, Minn

LOCATION.--Lat 46°48'03", long 95°52'37", in NW¼ sec.4, T.138 N., R.41 W., Becker County, near right bank 25 ft upstream from culvert on U.S. Highway 59, 500 ft downstream from outlet of St. Clair Lake, 1 mile upstream from Pelican River and 2 miles southwest of Detroit Lakes.

PERIOD OF RECORD.--July 1968 to current year.

GAGE.--Nonrecording gage read once daily. Datum of gage is 1,333.35 ft above mean sea level, datum of 1929.

EXTREMES.--Current year: Maximum discharge, 18 cfs Apr. 29 (gage height, 2.40 ft); minimum daily, 0.4 cfs, Jan. 16 to Feb. 1.
Period of record: Maximum discharge, 31 cfs Apr. 29, 1969 (gage height, 3.15 ft), minimum daily, 0.4 cfs Jan. 16 to Feb. 1, 1970.

REMARKS.--Record good except those for winter period, which are fair.

COOPERATION.--Gage reading furnished by Pelican River Watershed District.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.3	2.6	2.5	1.0	.40	5.7	5.0	16	9.9	11	4.0	1.7
2	2.5	2.6	2.5	.90	.50	5.6	4.9	14	9.9	10	4.0	1.7
3	2.5	2.6	2.5	.90	.50	5.5	4.9	13	9.5	8.8	4.0	1.7
4	2.6	2.6	2.5	.80	.60	5.4	4.9	12	9.2	8.0	3.9	1.5
5	3.6	2.5	2.5	.80	.70	5.4	5.0	11	8.1	7.5	3.9	1.5
6	3.9	2.5	2.5	.70	.90	5.4	5.6	11	7.5	6.8	3.9	1.5
7	3.9	2.6	2.5	.70	1.0	5.4	6.2	10	7.6	6.5	3.9	1.4
8	3.8	2.5	2.5	.70	1.3	5.4	8.3	10	5.5	5.6	3.8	1.4
9	3.7	2.4	2.5	.70	1.5	5.4	9.5	10	5.7	5.1	3.8	1.3
10	3.9	2.4	2.5	.60	1.9	5.4	9.5	11	6.4	4.9	3.7	1.2
11	4.0	2.1	2.5	.60	2.4	5.4	9.5	10	6.3	4.6	3.7	1.2
12	3.7	2.0	2.5	.50	3.0	5.4	9.5	9.9	6.6	4.6	3.6	1.0
13	3.6	2.1	2.5	.50	3.5	5.3	9.2	9.2	6.9	4.5	3.6	1.0
14	3.4	2.0	2.5	.50	4.2	5.3	9.2	9.0	7.3	4.5	3.3	1.0
15	3.1	2.0	2.5	.50	4.8	5.2	9.1	9.1	11	4.6	3.2	1.2
16	2.9	2.0	2.5	.40	5.4	5.2	9.5	9.0	15	4.6	3.0	1.4
17	2.6	1.9	2.5	.40	5.6	5.2	9.2	8.4	15	4.5	2.8	1.5
18	2.6	1.9	2.5	.40	5.8	5.2	9.0	8.2	14	4.5	2.6	1.5
19	2.6	1.9	2.5	.40	5.9	5.1	10	8.0	13	4.4	2.5	1.6
20	2.6	2.0	2.5	.40	5.9	5.1	10	7.7	14	4.4	2.3	1.6
21	2.6	2.2	2.4	.40	6.0	5.2	10	7.6	14	4.3	2.2	5.2
22	2.3	2.4	2.2	.40	6.0	5.4	11	7.3	13	4.3	2.2	5.5
23	2.1	2.5	2.1	.40	6.0	5.6	11	7.3	12	4.2	2.2	5.3
24	2.1	2.5	1.9	.40	5.9	5.6	13	7.5	11	4.2	2.1	5.2
25	2.2	2.5	1.8	.40	5.8	5.7	14	7.4	11	4.2	2.1	4.7
26	2.1	2.5	1.6	.40	5.8	5.5	14	7.3	13	4.1	2.1	4.3
27	2.1	2.5	1.5	.40	5.8	5.5	15	7.2	13	4.1	2.0	3.9
28	2.1	2.5	1.4	.40	5.7	5.5	16	7.0	12	4.1	2.0	3.7
29	2.0	2.5	1.3	.40	------	5.3	18	6.9	12	4.1	2.0	3.6
30	2.2	2.5	1.2	.40	------	5.3	17	7.3	11	4.1	1.9	3.4
31	2.3	------	1.1	.40	------	5.1	------	8.3	------	4.1	1.7	------
TOTAL	87.9	69.8	68.5	16.80	102.80	166.7	297.0	287.6	310.4	165.2	92.0	72.7
MEAN	2.84	2.33	2.21	.54	3.67	5.38	9.90	9.28	10.3	5.33	2.97	2.42
MAX	4.0	2.6	2.5	1.0	6.0	5.7	18	16	15	11	4.0	5.5
MIN	2.0	1.9	1.1	.40	.40	5.1	4.9	6.9	5.5	4.1	1.7	1.0
AC-FT	174	138	136	33	204	331	589	570	616	328	182	144

CAL YR 1969 TOTAL 1,777.90 MEAN 4.87 MAX 31 MIN .70 ACFT 3,530
WAT YR 1970 TOTAL 1,737.40 MEAN 4.76 MAX 18 MIN .40 ACFT 3,450

05035600 Pelican River at Muskrat Lake Outlet near Detroit Lakes, Minn.

LOCATION.--Lat 46°46'55", long 95°52'57", in SE¼ sec.8, T.138 N., R.41 W., Becker County, on downstream side of dam between Muskrat Lake and Sallie Lake at State Fish Hatchery, 3 miles southwest of Detroit Lakes.

PERIOD OF RECORD.--July 1968 to current year.

GAGE.--Two nonrecording gages. Datum of gage in the boat lock is 1,327.63 ft above mean sea level, datum of 1929, and in the spillway the datum of gage is 1,328.98 ft above mean sea level, datum of 1929.

EXTREMES.--Current year: Maximum daily discharge, 117 cfs Apr. 30; minimum daily discharge, 0.1 cfs Oct. 8 to Nov. 2.
Period of Record: Maximum daily discharge, 135 cfs Apr. 15, 1969; no flow for several days in most years.

REMARKS.--Records fair. Some regulation by manipulation of stoplogs in controls above station.

COOPERATION.--Gage readings and record of stoplog changes in dam furnished by Pelican River Watershed District.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.20	.10	9.9	11	9.5	9.5	14	109	58	45	4.5	.40
2	.20	.10	9.9	11	9.5	9.5	14	102	60	42	4.2	.50
3	.20	6.4	10	12	9.5	10	14	93	60	38	3.6	.50
4	.20	9.8	10	12	9.5	11	14	91	58	39	3.6	.50
5	.20	9.8	10	12	9.5	10	14	87	53	38	3.6	.50
6	.20	9.5	10	12	9.5	10	14	78	51	36	3.6	.30
7	.20	9.8	10	12	9.5	10	15	77	48	36	3.3	.30
8	.10	10	10	12	9.5	10	8.3	77	45	36	3.3	.30
9	.10	10	11	12	9.5	10	2.9	77	42	25	3.3	.30
10	.10	10	11	12	9.5	10	4.9	76	44	25	3.1	.30
11	.10	9.8	11	12	9.5	10	7.0	75	45	24	3.1	.20
12	.10	8.3	12	11	9.5	10	8.6	72	45	25	3.1	.20
13	.10	6.1	12	11	9.5	10	9.5	71	47	24	3.1	.20
14	.10	7.9	12	11	9.5	10	10	68	50	21	3.1	.20
15	.10	8.9	12	11	9.0	10	11	68	59	18	2.8	.30
16	.10	8.9	12	11	9.0	10	12	66	58	17	2.5	.30
17	.10	9.4	12	11	9.0	10	13	65	54	17	2.0	.40
18	.10	9.4	12	11	9.0	10	16	62	48	17	1.8	.40
19	.10	9.4	12	11	9.0	10	26	56	52	17	1.6	.40
20	.10	9.4	12	11	9.0	10	27	54	60	17	1.3	.50
21	.10	9.4	12	11	9.0	10	38	53	57	16	.80	6.6
22	.10	9.4	12	11	9.0	10	48	51	53	12	.60	8.5
23	.10	9.4	12	11	8.5	10	51	51	52	12	.60	5.0
24	.10	9.4	12	10	9.0	10	52	48	52	6.9	.60	5.0
25	.10	9.4	12	10	9.0	10	53	47	51	5.6	.60	4.0
26	.10	9.4	12	10	9.0	12	57	44	56	5.3	.50	3.8
27	.10	9.4	11	10	9.0	15	62	46	50	5.3	.50	3.5
28	.10	9.9	11	10	9.0	14	95	46	50	5.6	.50	3.2
29	.10	9.9	11	10	------	14	114	47	50	5.3	.40	3.0
30	.10	9.9	11	10	------	14	117	48	47	5.3	.40	3.0
31	.10	------	11	10	------	14	------	52	------	4.9	.60	------
TOTAL	3.80	258.50	347.8	342	258.5	333.0	942.2	2,057	1,555	641.2	66.60	52.60
MEAN	.12	8.62	11.2	11.0	9.23	10.7	31.4	66.4	51.8	20.7	2.15	1.75
MAX	.20	10	12	12	9.5	15	117	109	60	45	4.5	8.5
MIN	.10	.10	9.9	10	8.5	9.5	2.9	44	42	4.9	.40	.20
AC-FT	7.5	513	690	678	513	661	1,870	4,080	3,080	1,270	132	104

CAL YR 1969 TOTAL 7,328.80 MEAN 20.1 MAX 135 MIN .10 ACFT 14,540
WAT YR 1970 TOTAL 6,858.20 MEAN 18.8 MAX 117 MIN .10 ACFT 13,600

05037100 Pelican River at Sallie Lake Outlet, near Detroit Lakes, Minn.

LOCATION.--Lat 46°45'27", long 95°53'57", in NW¼ sec.20, T.138 N., R.41 W., Becker County, on left bank near downstream end of culvert on County Highway 22, 250 ft downstream from Sallie Lake, 800 ft upstream from Minnesota Department of Conservation dam and 5 miles southwest of city of Detroit Lakes.

PERIOD OF RECORD.--July 1968 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,327.58 ft above mean sea level, datum of 1929.

EXTREMES.--Current year: Maximum daily discharge, 86 cfs May 10, 11; no flow Oct. 1-4, Sept. 8-20.
Period of record: Maximum discharge, 116 cfs Apr. 21, 1969 (gage height, 1.49 ft); no flow for several days in 1969, 1970.

REMARKS.--Records good.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	.12	5.5	12	12	11	18	79	71	59	5.4	.20
2	0	.13	5.1	12	12	11	18	79	69	60	4.9	.15
3	0	.13	5.5	13	11	18	18	79	47	56	3.8	.17
4	0	.16	5.5	13	12	21	18	79	45	52	3.1	.12
5	.19	.22	5.6	13	12	19	18	79	64	49	2.5	.09
6	.16	.26	6.2	13	12	18	19	80	75	25	2.4	.08
7	.16	.28	6.8	13	12	18	19	78	72	19	2.1	.08
8	.15	.40	8.3	13	11	18	20	82	71	19	1.9	0
9	.13	.55	9.6	13	11	16	17	83	68	19	1.8	0
10	.18	.66	9.8	13	11	16	15	86	68	19	1.7	0
11	.21	.85	9.6	13	11	16	15	86	84	19	1.7	0
12	.19	.96	10	13	11	14	13	85	76	20	1.3	0
13	.15	1.2	11	13	11	13	13	82	79	25	1.2	0
14	.12	1.2	11	13	11	14	15	79	73	25	1.1	0
15	.10	1.0	12	12	10	15	16	80	80	25	.87	0
16	.10	1.1	12	12	11	15	18	79	83	20	.62	0
17	.08	1.8	12	12	11	15	21	78	80	19	.48	0
18	.08	2.2	12	12	12	15	21	75	79	17	.35	0
19	.08	2.2	12	12	11	15	38	73	75	14	.41	0
20	.09	2.3	12	12	11	16	47	71	70	12	.26	0
21	.09	2.3	12	12	11	16	66	71	69	11	.21	.70
22	.08	2.4	12	12	11	16	76	70	67	9.4	.27	.63
23	.07	2.7	12	12	10	16	78	70	67	7.5	.24	.64
24	.07	3.3	12	12	10	16	78	70	67	6.4	.22	.58
25	.08	3.7	12	12	11	17	78	71	66	6.1	.22	.78
26	.10	3.8	12	12	10	18	78	69	71	5.4	.21	.76
27	.07	3.9	12	12	11	18	76	67	73	5.6	.20	.86
28	.07	4.7	12	12	11	18	79	67	68	4.9	.17	.86
29	.07	4.8	12	13	------	18	79	68	66	5.7	.18	.87
30	.07	5.4	12	12	------	18	79	68	63	6.3	.30	.81
31	.07	------	12	11	------	18	------	71	------	7.1	.20	------
TOTAL	3.01	54.72	313.7	384	311	503	1,164	2,354	2,106	648.4	40.31	8.38
MEAN	.097	1.82	10.1	12.4	11.1	16.2	38.8	75.9	70.2	20.9	1.30	.28
MAX	.21	5.4	12	13	12	21	79	86	84	60	5.4	.87
MIN	0	.12	.1	11	10	11	13	67	45	4.9	.17	0
AC-FT	6.0	109	22	762	617	998	2,310	4,670	4,180	1,290	80	17

CAL YR 1969 TOTAL 8,553.96 MEAN 23.4 MAX 107 MIN 0 AC-FT 16,970
WTR YR 1970 TOTAL 7,890.52 MEAN 21.6 MAX 86 MIN 0 AC-FT 15,650

05039100 Pelican River at Lake Melissa Outlet near Detroit Lakes, Minn.

LOCATION.--Lat 46°43'50", long 95°53'40", in NW¼ sec.32, T.138 N., R.41 W., Becker County, on left bank 50 ft downstream from Lake Melissa, 400 ft upstream from culvert on county road and 6 miles southwest of Detroit Lakes.

PERIOD OF RECORD.--July 1968 to current year.

GAGE.--Nonrecording gage read once daily. Altitude of gage is 1,330 ft (from topographic map).

EXTREMES.--Current year: Maximum daily discharge, 95 cfs May 9-18; maximum gage height, 2.28 ft June 18; minimum daily discharge, 0.1 cfs Oct. 21 to Nov. 12, Aug. 28 to Sept. 19.
Period of record: Maximum discharge, 115 cfs May 5-11, 1969 (gage height, 2.20 ft): no flow Sept. 10-20, 1969.

REMARKS.--Records good. Records of chemical analyses for the current year are published in Part 2 of this report. Flow affected by storage in lakes above station.

COOPERATION.--Gage readings furnished by Pelican River Watershed District.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.20	.10	3.1	16	15	14	26	91	72	58	8.8	.10
2	.20	.10	3.1	16	15	14	26	94	71	56	6.8	.10
3	.20	.10	4.0	16	15	14	26	94	68	53	5.6	.10
4	.20	.10	4.7	16	15	15	26	94	67	52	4.7	.10
5	.20	.10	5.2	16	15	16	26	94	65	51	4.0	.10
6	.20	.10	5.7	16	15	17	27	94	63	51	3.5	.10
7	.20	.10	6.2	16	15	17	27	94	63	51	3.1	.10
8	.20	.10	6.7	16	14	18	27	94	62	50	2.6	.10
9	.20	.10	7.4	16	14	19	27	95	64	50	2.3	.10
10	.20	.10	8.2	16	14	19	28	95	65	50	1.9	.10
11	.20	.10	8.4	16	14	20	29	95	66	49	1.5	.10
12	.20	.10	8.7	16	14	20	29	95	67	48	1.3	.10
13	.20	.30	9.5	16	14	21	29	95	68	48	1.1	.10
14	.20	.40	9.5	16	14	21	30	95	70	45	.90	.10
15	.20	.40	9.5	16	14	21	30	95	72	34	.80	.10
16	.20	.40	10	16	14	21	30	95	74	30	.60	.10
17	.20	.60	10	16	14	22	31	95	79	29	.50	.10
18	.20	.60	11	16	14	22	32	95	81	26	.50	.10
19	.20	.60	11	16	14	22	34	91	79	23	.40	.10
20	.20	.60	11	16	14	22	36	90	78	22	.40	.20
21	.10	.80	11	16	14	23	37	88	78	21	.40	.20
22	.10	.80	12	16	14	23	39	87	75	20	.30	.30
23	.10	.80	13	16	14	23	41	84	73	19	.30	.30
24	.10	1.0	13	16	14	23	45	84	71	17	.20	.30
25	.10	1.2	13	16	14	23	50	84	70	16	.20	.30
26	.10	1.9	14	16	14	24	55	81	66	16	.20	.30
27	.10	2.0	14	16	14	24	59	79	64	15	.20	.30
28	.10	2.5	14	16	14	25	72	78	62	14	.10	.30
29	.10	2.5	14	15	------	26	78	76	61	13	.10	.30
30	.10	3.1	15	15	------	26	85	75	60	12	.10	.30
31	.10	------	16	15	------	26	------	74	------	10	.10	------
TOTAL	5.10	21.70	301.9	493	399	641	1,137	2,770	2,074	1,049	53.50	5.00
MEAN	.16	.72	9.74	15.9	14.3	20.7	37.9	89.4	69.1	33.8	1.73	.17
MAX	.20	3.1	16	16	15	26	85	95	81	58	8.8	.30
MIN	.10	.10	3.1	15	14	14	26	74	60	10	.10	.10
AC-FT	10	43	599	978	791	1,270	2,260	5,490	4,110	2,080	106	9.9

CAL YR 1969 TOTAL 9,598.60 MEAN 26.3 MAX 115 MIN 0 ACFT 19,040
WAT YR 1970 TOTAL 8,950.20 MEAN 24.5 MAX 95 MIN .10 ACFT 17,750

05040500 Pelican River near Fergus Falls, Minn.

LOCATION.--Lat 46°20'10", long 96°07'10", in NE¼ sec.17, T.133 N., R.43 W., Otter Tail County, on left bank 990 ft downstream from bridge on U. S. Highway 52, 3 miles northwest of Fergus Falls and 7.5 miles upstream from mouth.

DRAINAGE AREA.--482 sq mi.

PERIOD OF RECORD.--June 1909 to December 1912, July 1942 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,176.98 ft above mean sea level, datum of 1929 (levels by Minnesota Highway Department). June 19, 1909, to Dec. 31, 1912, nonrecording gage at site 1 mile downstream at different datum. July 1, 1942, to Nov. 6, 1955, nonrecording gage and Nov. 7, 1955, to Sept. 30, 1963, water-stage recorder at site 900 ft upstream at datum 3.00 ft higher.

AVERAGE DISCHARGE.--31 years (1909-12, 1942-70), 77.3 cfs (56,000 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 350 cfs June 20 (gage height, 4.38 ft); maximum gage height, 5.98 ft Mar. 22 (backwater from ice); minimum discharge, 10 cfs Sept. 13, 14 (gage height, 3.02 ft).
Period of record: Maximum discharge, 756 cfs Mar. 29, 1943 (gage height, 8.53 ft, present datum); maximum gage height, 8.99 ft Mar. 21, 1966 (backwater from ice); no flow on many days in 1946, 1949-50.

REMARKS.--Records good except those for winter months, which are fair. Records of suspended sediment loads for the water year 1970 are published in Part 2 of this report.

REVISIONS.--WSP 955: Drainage area.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	18	21	16	19	24	30	49	167	186	123	64	18
2	18	21	16	19	24	30	54	160	186	114	62	18
3	19	21	16	19	24	38	60	160	190	114	59	16
4	20	21	16	19	24	36	65	152	182	108	59	15
5	22	21	16	19	24	32	100	149	174	108	57	14
6	24	21	16	19	25	32	115	145	170	108	56	12
7	25	21	16	19	25	32	140	145	163	106	53	12
8	25	20	16	19	25	33	170	145	160	99	51	12
9	25	20	16	19	25	33	212	149	152	99	51	11
10	25	19	16	19	25	33	260	160	156	94	48	11
11	24	18	16	20	25	33	145	163	163	90	45	11
12	24	17	16	20	25	33	108	167	160	88	42	11
13	24	14	16	20	25	33	97	167	167	88	40	11
14	23	12	16	20	25	34	99	167	178	84	37	11
15	22	12	16	20	25	35	97	170	224	84	34	12
16	22	12	16	20	26	36	101	170	228	82	30	14
17	22	13	16	20	27	37	101	167	233	84	30	14
18	21	13	17	20	27	37	99	163	242	84	30	14
19	21	13	17	20	27	37	111	156	251	86	30	14
20	21	13	17	20	27	37	135	156	300	84	28	14
21	22	13	17	20	28	38	156	156	256	82	29	14
22	22	14	17	21	28	40	163	156	228	76	29	13
23	22	14	17	21	29	40	167	160	207	74	28	12
24	22	14	17	21	29	40	178	163	186	73	28	14
25	21	14	17	21	30	41	182	170	174	69	27	14
26	21	14	17	21	30	41	170	167	163	67	25	14
27	21	14	17	22	30	41	163	170	152	64	23	14
28	20	15	18	22	30	41	174	163	145	62	21	14
29	20	15	18	22	------	43	182	174	138	61	20	13
30	20	15	18	23	------	45	174	170	132	57	20	12
31	20	------	19	23	------	47	------	182	------	73	19	------
TOTAL	676	485	515	627	738	1,138	4,027	5,009	5,646	2,685	1,175	399
MEAN	21.8	16.2	16.6	20.2	26.4	36.7	134	162	188	86.6	37.9	13.3
MAX	25	21	19	23	30	47	260	182	300	123	64	18
MIN	18	12	16	19	24	30	49	145	132	57	19	11
AC-FT	1,340	962	1,020	1,240	1,460	2,260	7,990	9,940	11,200	5,330	2,330	791

CAL YR 1969 TOTAL 38,337 MEAN 105 MAX 688 MIN 12 AC-FT 76,040
WTR YR 1970 TOTAL 23,120 MEAN 63.3 MAX 300 MIN 11 AC-FT 45,860

05045950 Orwell Reservoir near Fergus Falls, Minn.

LOCATION.--Lat 46°12'55", long 96°10'40", in SW¼ sec.26, T.132 N., R.44 W., Otter Tail County, at dam in Otter Tail River at outlet of Orwell Reservoir, 7 miles southwest of Fergus Falls, Minn.

DRAINAGE AREA.--1,830 sq mi, approximately.

PERIOD OF RECORD.--March 1953 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,000.00 ft above mean sea level, adjustment of 1912. Gage readings reduced to elevations above mean sea level.

EXTREMES.--Current year: Maximum contents, 12,890 acre-ft Oct. 14 (elevation, 1,068.89 ft); minimum, 871 acre-ft Apr. 2 (elevation, 1,047.14 ft).
Period of record: Maximum contents, 16,920 acre-ft June 17, 1962, May 23, 1966 (elevation, 1,072.38 ft); minimum (after initial filling), 844 acre-ft Aug. 26, 27, 1953 (elevation, 1,046.96 ft).

REMARKS.--Reservoir is formed by earth dam with concrete spillway with one taintor gate; storage began in March 1953. Capacity to elevation, 1,070 ft (Maximum operating stage) is 14,100 acre-ft of which 13,100 acre-ft is controlled storage above elevation 1,048 ft (minimum operating stage). Dead storage, 210 acre-ft. Figures given herein represent total contents. Reservoir is used for flood control and to increase low flow for water supply and pollution abatement.

COOPERATION.--Records furnished by Corps of Engineers.

MONTHEND ELEVATION AND CONTENTS, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Date	Elevation (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept.30	1,067.26	11,330	-
Oct. 31	1,067.09	11,180	-150
Nov. 30	1,063.13	7,900	-3,280
Dec. 31	1,061.80	6,960	-940
CAL YR 1969	-	-	+2,740
Jan. 31	1,056.95	4,080	-2,880
Feb. 28	1,049.92	1,430	-2,650
Mar. 31	1,047.59	938	-492
Apr. 30	1,050.82	1,700	+762
May 31	1,050.92	1,730	+30
June 30	1,050.16	1,500	-230
July 31	1,054.71	3,080	+1,580
Aug. 31	1,063.52	8,220	+5,140
Sept.30	1,067.93	11,940	+3,720
WTR YR 1970	-	-	+610

05046000 Otter Tail River below Orwell Dam, near Fergus Falls, Minn.

LOCATION.--Lat 46°12'35", long 96°11'05", in NE¼ sec.34, T.132 N., R.44 W., Otter Tail County, on left bank 0.7 mile downstream from Orwell Dam, 6.1 miles downstream from Dayton Hollow Dam, 8 miles southwest of Fergus Falls, and 11.1 miles downstream from Pelican River.

DRAINAGE AREA.--1,830 sq mi, approximately.

PERIOD OF RECORD.--October 1930 to current year. Prior to October 1952, published as Otter Tail River below Pelican River, near Fergus Falls. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 1,029.65 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). Oct. 11, 1930, to Nov. 17, 1933, at same site at datum 2.00 ft higher; Nov. 18, 1933, to Mar. 21, 1953, at site 6.1 miles upstream at datum 40.30 ft higher.

AVERAGE DISCHARGE.--40 years, 286 cfs (207,200 acre-ft per year).

EXTREMES.--Current year: Maximum discharge 935 cfs June 22 (gage height, 3.88 ft); minimum, 0.70 cfs Aug. 5 (gage height, 1.28 ft) regulation.
Period of record: Maximum discharge, 1,710 cfs June 17, 1953 (gage height, 5.60 ft, backwater from aquatic vegetation); minimum, 0.7 cfs Aug. 5 (gage height, 1.28 ft), result of regulation.

REMARKS.--Records good. Flow regulated by Orwell Reservoir beginning Mar. 21, 1953 (see preceding page) and powerplants upstream.

REVISIONS (WATER YEARS).--WSP 785: 1934(M). WSP 1208: 1947(M). WSP 1308: 1931(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	60	149	149	210	182	169	161	570	855	709	246	46
2	60	149	149	210	205	169	103	599	885	703	246	29
3	60	149	149	210	203	173	76	593	861	703	92	20
4	60	149	149	210	200	230	123	582	808	697	5.0	20
5	60	149	149	210	197	294	173	582	767	685	70	19
6	60	149	149	210	196	289	240	627	709	599	306	20
7	60	149	149	205	182	267	240	639	639	587	311	19
8	58	149	149	205	178	251	283	593	633	633	256	18
9	58	149	149	205	173	235	390	553	622	627	196	9.5
10	58	149	149	205	230	201	524	564	490	610	173	9.9
11	58	149	149	205	267	214	564	622	468	576	173	9.9
12	58	149	149	205	261	256	559	668	604	536	137	9.9
13	78	149	149	201	256	278	513	668	633	479	120	11
14	130	149	149	201	246	272	440	668	604	440	120	12
15	153	149	149	201	240	261	339	668	616	446	123	12
16	153	153	145	201	240	240	384	680	761	423	126	12
17	153	153	145	201	235	214	440	697	790	334	123	13
18	153	150	149	191	232	219	406	691	767	278	100	13
19	149	150	149	187	246	219	384	685	697	311	86	13
20	149	150	149	187	235	219	418	680	703	378	86	13
21	149	149	149	182	224	224	440	685	767	356	86	13
22	153	149	149	173	219	214	429	738	885	328	89	13
23	153	157	149	173	214	214	429	738	831	311	89	13
24	149	157	149	173	214	219	457	732	732	272	89	13
25	153	157	149	173	210	235	479	743	738	240	69	34
26	153	153	149	178	191	261	496	767	720	246	44	89
27	153	153	149	182	169	256	490	790	738	195	44	89
28	153	153	149	185	169	235	513	790	732	235	44	86
29	149	153	149	181	------	224	524	808	726	256	44	86
30	149	153	149	178	------	187	536	825	714	206	46	100
31	149	------	178	173	------	161	------	825	------	256	46	------
TOTAL	3,491	4,525	4,640	6,011	6,014	7,100	11,553	21,070	21,495	13,655	3,785.0	865.2
MEAN	113	151	150	194	215	229	385	680	717	440	122	28.8
MAX	153	157	178	210	267	294	564	825	885	709	311	100
MIN	58	149	145	173	169	161	76	553	468	195	5.0	9.5
AC-FT	6,920	8,980	9,200	11,920	11,930	14,080	22,920	41,790	42,640	27,080	7,510	1,720

CAL YR 1969 TOTAL 149,610.0 MEAN 410 MAX 1,230 MIN 49 AC-FT 296,800
WTR YR 1970 TOTAL 104,204.2 MEAN 285 MAX 885 MIN 5.0 AC-FT 206,700

05050000 Bois de Sioux River near White Rock, S. Dak.

LOCATION.--Lat 45°51'45", long 96°34'25", in SW¼SW¼ sec.27, T.128 N., R.47 W., Roberts County, on left bank just downstream from Big Slough Outlet, 300 ft downstream from White Rock Dam, 4 miles south of Whits Rock, and 5 miles northwest of Wheaton, Minn.

DRAINAGE AREA.--1,160 sq mi, approximately.

PERIOD OF RECORD.--October 1941 to current year.

GAGE.--Water-stage recorder. Datum of gage is 960.00 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). Prior to Jan. 14, 1943, nonrecording gage at same site at datum 0.11 ft lower. Jan. 15, 1943, to Sept. 30, 1963, water stage recorder at same site at datum 0.11 ft lower.

AVERAGE DISCHARGE.--29 years, 85.1 cfs (1.00 inches per year, 61,650 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 102 cfs, Oct. 14 (gage height, 4.68 ft); maximum gage height, 4.87 ft Mar. 24 (backwater from ice); no flow for many days.
Period of record: Maximum discharge 3,770 cfs, occurred during period Apr. 19-21, 1969 (gage height, 15.07 ft, from flood mark); no flow at times in most years.

REMARKS.--Records poor. Flow regulated by Lake Traverse-Bois de Sioux Flood Control and Water Conservation project (available capacity for flood control, 137,000 acre-ft.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0	.90				0	1.8	18	23	.30		
2	0	.80				0	2.0	15	20	.30		
3	0	.80				5.0	2.1	13	22	.20		
4	.20	.70				3.7	2.3	11	19	.20		
5	1.0	.70				2.9	2.6	10	13	.10		
6	1.5	.70				2.4	2.9	8.2	9.7	.10		
7	2.0	.60				2.1	3.2	7.0	7.2	0		
8	2.5	.60				1.9	3.5	6.0	5.6	0		
9	3.0	.60				1.7	4.0	5.1	4.0	0		
10	2.8	.50				1.5	4.5	4.4	3.2	0		
11	2.6	.50				1.4	5.2	3.8	2.6	0		
12	2.4	.50				1.3	6.2	3.3	2.1	0		
13	2.4	.40				1.2	7.6	2.8	1.6	0		
14	9.8	.40				1.1	10	2.5	1.3	0		
15	2.7	.30				1.1	17	2.2	1.5	0		
16	2.3	.20				1.1	38	1.9	1.7	0		
17	2.0	.10				1.1	30	1.7	1.9	0		
18	1.8	0				1.1	20	1.5	1.6	0		
19	1.6	0				1.1	16	1.3	1.2	0		
20	1.5	0				1.2	18	1.2	2.0	0		
21	1.4	0				1.2	24	1.0	3.0	0		
22	1.3	0				1.2	29	.90	2.4	0		
23	1.2	0				1.3	29	.80	1.8	0		
24	1.2	0				1.3	25	.70	1.6	0		
25	1.1	0				1.3	21	.90	1.3	0		
26	1.1	0				1.4	19	1.5	1.2	0		
27	1.0	0				1.4	17	1.9	.90	0		
28	1.0	0				1.5	23	1.7	.70	0		
29	3.0	0			------	1.6	27	1.5	.50	0		
30	1.1	0			------	1.6	22	1.3	.40	0		
31	1.0	------			------	1.7	------	1.1	------	0		------
TOTAL	56.50	9.30	0	0	0	48.4	432.9	133.20	158.00	1.20	0	0
MEAN	1.82	.31	0	0	0	1.56	14.4	4.30	5.27	.039	0	0
MAX	9.8	.90	0	0	0	5.0	38	18	23	.30	0	0
MIN	0	0	0	0	0	0	1.8	.70	.40	0	0	0
AC-FT	112	18	0	0	0	96	859	264	313	2.4	0	0

CAL YR 1969 TOTAL 92,205.90 MEAN 253 MAX 3,380 MIN 0 ACFT 182,900
WAT YR 1970 TOTAL 839.50 MEAN 2.3 MAX 38 MIN 0 ACFT 1,670

05051500 Red River of the North at Wahpeton, N. Dak.

LOCATION.--Lat 46°15'55", long 96°35'40", in NE¼ sec.8, T.132 N., R.47 W., Richland County, on left bank in Wahpeton, 800 ft downstream from confluence of Bois de Sioux and Otter Tail Rivers and at mile 548.6.

DRAINAGE AREA.--4,010 sq mi, approximately.

PERIOD OF RECORD.--April 1942 to current year. Gage-height records collected in this vicinity since 1917 are contained in reports of U.S. Weather Bureau.

GAGE.--Water-stage recorder and concrete and wooden dam. Datum of gage is 942.97 ft above mean sea level. Prior to Aug. 6, 1943, U.S. Weather Bureau nonrecording gage 800 ft upstream, converted to present datum. Aug. 6, 1943, to Oct. 27, 1950, nonrecording gage at present site and datum.

AVERAGE DISCHARGE.--27 years (1943-70), 536 cfs (388,300 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 1,450 cfs Apr. 8 (gage height, 6.93 ft, backwater from ice); minimum, 9.0 cfs Sept. 14 (gage height, 2.54 ft).
Period of record: Maximum discharge, 9,200 cfs Apr. 10, 1969 (gage height, 16.34 ft); minimum, 8 cfs Aug. 25, 1961 (gage height, 2.26 ft); minimum gage height, 1.76 ft Sept. 8, 9, 1969 (gates open).
Maximum stage known, 17.0 ft in spring of 1897 (10,500 cfs).

REMARKS.--Records good. Flow regulated by Orwell Reservoir (capacity, 14,100 acre-ft at elevation 1,070 ft above mean sea level, adjustment of 1912); Lake Traverse (capacity, 137,000 acre-ft), available for flood control; numerous other controlled lakes and ponds, and several powerplants.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	71	140	136	145	125	160	233	672	927	756	170	39
2	72	136	135	160	125	165	221	688	927	740	160	38
3	74	135	136	170	134	200	178	712	963	720	150	37
4	78	133	129	170	159	174	119	700	963	728	144	25
5	89	131	134	173	160	175	183	684	923	728	37	17
6	76	128	142	174	163	255	339	680	858	700	20	16
7	66	128	142	180	157	272	517	692	804	648	223	14
8	67	130	140	175	149	275	1,200	732	720	580	289	14
9	69	129	138	170	153	259	1,400	700	688	624	261	15
10	72	126	140	165	151	239	1,000	652	672	628	200	15
11	79	125	145	165	165	191	792	652	616	620	166	13
12	79	126	139	170	206	205	760	684	512	596	163	13
13	81	94	134	170	220	247	732	740	620	556	141	10
14	86	78	135	171	220	279	672	748	668	512	106	11
15	119	106	135	168	214	282	592	752	728	456	101	20
16	139	150	138	157	208	283	460	752	850	448	103	21
17	141	145	140	158	231	280	476	760	896	429	109	18
18	142	108	140	165	214	247	548	760	914	335	109	17
19	140	92	140	160	200	246	556	768	900	264	100	16
20	143	129	138	155	209	248	536	764	905	278	73	14
21	139	145	134	148	207	258	652	756	854	338	72	12
22	139	147	121	142	212	274	854	764	866	338	71	10
23	139	142	123	163	195	260	833	792	927	317	77	9.9
24	137	139	140	179	184	253	792	829	963	300	79	12
25	137	138	140	170	174	279	748	808	854	280	80	17
26	137	138	138	147	166	322	724	812	808	260	74	17
27	135	133	135	135	162	351	708	837	800	245	42	64
28	135	134	136	136	155	308	696	858	792	230	35	96
29	134	134	132	122	------	322	680	879	784	215	38	90
30	134	133	125	114	------	292	672	883	776	200	42	80
31	136	------	125	126	------	284	------	923	------	185	41	------
TOTAL	3,385	3,852	4,205	4,903	5,018	7,885	18,873	23,433	24,478	14,254	3,476	790.9
MEAN	109	128	136	158	179	254	629	756	816	460	112	26.4
MAX	143	150	145	180	231	351	1,400	923	963	756	289	96
MIN	66	78	121	114	125	160	119	652	512	185	20	9.9
AC-FT	6,710	7,640	8,340	9,730	9,950	15,640	37,430	46,480	48,550	28,270	6,890	1,570

CAL YR 1969 TOTAL 322,062.0 MEAN 882 MAX 8,940 MIN 30 AC-FT 638,800
WTR YR 1970 TOTAL 114,552.9 MEAN 314 MAX 1,400 MIN 9.9 AC-FT 227,200

05054000 Red River of the North at Fargo, N. Dak.

LOCATION.--Lat 46°51'40", long 96°47'00", in NW¼NE¼ sec.18, T.139 N., R.48 W., Cass County, at city waterplant on 4th St. S. in Fargo, 25 miles upstream from mouth of Sheyenne River and at mile 453.0.

DRAINAGE AREA.--6,800 sq mi, approximately.

PERIOD OF RECORD.--May 1901 to current year. Published as "at Moorhead, Minn." 1901. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 861.8 ft above mean sea level. Oct. 1, 1960, to Sept. 30, 1962, water-stage recorder at present site at datum 5.6 ft higher. Since Oct. 1, 1960, auxiliary water-stage recorder 2 miles upstream. See WSP 1728 or 1913 for history of changes prior to Oct. 1, 1960.

AVERAGE DISCHARGE (UNADJUSTED).--69 years, 536 cfs (388,300 acre-ft per year); median of yearly mean discharges, 440 cfs (319,000 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 2,480 cfs June 18 (gage height, 16.27 ft); no flow Sept. 30.
Period of record: Maximum discharge, 25,300 cfs Apr. 15, 1969 (gage height, 37.34 ft); no flow for many days in each year for period 1932-41; Sept. 30, 1970.
Maximum stage known, 40.1 ft Apr. 7, 1897, site and datum in use prior to 1914 (discharge, 25,000 cfs).

REMARKS.--Records good. Flow regulated by Orwell Reservoir (capacity, 14,100 acre-ft at elevation 1,070 ft above mean sea level, adjustment of 1912); Lake Traverse (capacity, 137,000 acre-ft, available for flood control); other controlled lakes and ponds and several powerplants. Some small diversions for municipal supply. Figures of daily discharge do not include diversion by cities of Fargo and Moorhead. Records of chemical analyses for water year 1970 are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 1308: 1902-4, 1906-7, 1910-14, 1916, 1918, 1924. WSP 1388: 1905-6, 1917-20(M), 1935(M), 1938-39(M), 1943.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	52	137	114	107	152	186	380	896	1,010	941	194	20
2	52	141	114	107	148	177	380	852	1,010	905	199	17
3	57	144	122	114	144	208	362	836	1,030	869	194	16
4	70	144	122	125	133	169	356	828	1,040	852	203	15
5	62	144	118	148	137	169	436	828	1,070	820	194	16
6	54	133	114	152	133	186	590	812	1,080	780	194	16
7	52	122	114	165	125	181	852	780	1,060	740	152	13
8	57	122	122	169	118	173	1,260	772	1,120	724	68	14
9	57	122	122	165	133	194	1,260	780	1,010	676	65	13
10	57	122	118	165	129	213	1,470	804	905	605	94	14
11	48	122	114	160	129	213	1,590	788	820	582	208	14
12	46	122	107	156	129	236	1,770	740	780	582	218	11
13	44	120	101	160	137	232	1,620	716	740	590	181	11
14	44	118	101	160	148	208	1,340	748	644	575	144	10
15	44	84	98	165	194	199	1,180	796	772	538	144	14
16	41	70	98	165	203	232	950	812	1,320	510	129	12
17	44	81	98	160	213	267	896	812	2,260	456	98	12
18	70	91	98	169	208	272	684	812	2,390	430	84	11
19	107	114	101	165	222	267	660	820	2,070	404	78	9.6
20	129	114	107	152	236	267	756	836	1,750	380	68	37
21	137	104	114	156	241	272	852	836	1,540	310	68	37
22	137	94	118	160	222	283	1,130	836	1,480	272	68	19
23	141	104	114	156	218	277	1,370	836	1,410	277	57	17
24	129	133	114	148	208	283	1,650	852	1,300	299	46	12
25	133	144	107	144	208	288	1,470	878	1,240	310	35	12
26	141	144	107	144	208	310	1,260	896	1,220	293	35	12
27	133	137	114	165	203	327	1,190	896	1,140	283	30	9.0
28	133	133	122	186	194	327	1,130	914	1,040	236	29	7.2
29	133	125	122	177	------	356	1,010	986	986	222	45	2.4
30	129	118	118	165	------	386	950	977	968	194	48	0
31	133	------	107	152	------	392	------	1,020	------	171	25	------
TOTAL	2,666	3,603	3,460	4,782	4,873	7,750	30,804	25,995	36,205	15,826	3,395	423.2
MEAN	86.0	120	112	154	174	250	1,027	839	1,207	511	110	14.1
MAX	141	144	122	186	241	392	1,770	1,020	2,390	941	218	37
MIN	41	70	98	107	118	169	356	716	644	171	25	0
AC-FT	5,290	7,150	6,860	9,490	9,670	15,370	61,100	51,560	71,810	31,390	6,730	839
+	706	668	739	737	700	748	664	734	831	1,478	1,344	810

ADJUSTED FOR DIVERSION IN ACRE-FEET BY CITIES OF FARGO AND MOORHEAD

MEAN	97.5	131	124	166	187	262	1,038	850	1,221	535	131	27.7
AC-FT	6,000	7,820	7,600	10,230	10,370	16,120	61,760	52,290	72,640	32,870	8,070	1,650

		OBSERVED									ADJUSTED		
CAL YR 1969	TOTAL	521,202.0	MEAN	1,428	MAX	24,800	MIN	28	AC-FT	1,034,000	MEAN 1,442	AC-FT	1,044,000
WTR YR 1970	TOTAL	139,782.2	MEAN	383	MAX	2,390	MIN	0	AC-FT	277,300	MEAN 397	AC-FT	287,400

+ Diversion in acre-feet by cities of Fargo and Moorhead.

05061000 Buffalo River near Hawley, Minn.

LOCATION.--Lat 46°51'00", long 96°19'45", near center of SE¼ sec.14, T.139 N., R.45 W., Clay County, near left downstream end of bridge on farm lane, 2 miles southwest of Hawley.

DRAINAGE AREA.--322 sq mi.

PERIOD OF RECORD.--March 1945 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,111.91 ft above mean sea level, datum of 1929. Prior to Jan. 29, 1953, nonrecording gage at bridge 1,800 ft upstream at datum 3.17 ft lower.

AVERAGE DISCHARGE.--25 years, 72.3 cfs (52,380 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 498 cfs Apr. 10 (gage height, 6.98 ft); minimum, 6.2 cfs Aug. 28 (gage height, 2.82 ft).
Period of record: Maximum discharge, 1,880 cfs Apr. 9, 1969 (gage height, 9.07 ft); maximum gage height, 9.31 ft Aug. 5, 1955; minimum discharge, 4.8 cfs Aug. 27, 1969; minimum gage height, 2.55 ft Sept. 5, 1961.
Maximum stage known, about 11.3 ft, present datum, spring of 1921, from information by local resident.

REMARKS.--Records good except those for winter months, which are fair.

REVISIONS (WATER YEARS).--WSP 1308: 1945-46(M), 1948(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	25	32	25	15	14	17	18	419	118	82	15	9.4
2	23	34	23	14	14	17	18	365	119	76	15	9.2
3	22	37	22	14	14	17	19	320	107	70	13	9.0
4	28	36	21	14	15	17	21	278	98	67	13	8.5
5	30	35	21	14	15	16	40	241	90	63	12	7.6
6	36	34	20	14	15	16	100	209	83	60	13	7.5
7	41	32	20	14	15	16	153	187	79	56	13	7.5
8	38	31	20	13	15	16	271	173	76	53	12	7.3
9	34	31	20	13	15	16	417	162	74	49	12	7.6
10	31	30	20	13	15	16	478	160	72	46	12	7.8
11	36	29	20	13	15	16	393	157	71	44	13	8.0
12	43	29	20	13	15	15	311	148	72	42	11	7.6
13	40	27	19	13	15	15	255	139	73	41	12	7.9
14	36	26	19	13	15	15	226	135	73	39	12	8.1
15	33	26	19	12	15	15	200	140	80	37	11	9.2
16	31	25	19	12	15	16	190	145	163	35	11	8.9
17	29	25	18	12	16	18	180	138	192	33	10	11
18	27	24	18	12	16	21	164	124	185	31	11	12
19	26	24	18	12	16	23	161	114	174	28	10	11
20	25	24	18	12	16	24	146	106	167	27	10	14
21	24	24	17	12	16	27	169	103	154	26	9.4	16
22	24	25	17	12	16	32	207	101	146	24	9.2	15
23	24	25	17	13	16	30	224	99	137	22	8.8	16
24	23	26	16	13	16	28	246	100	121	21	8.5	13
25	24	26	16	13	16	25	268	101	108	20	8.1	12
26	25	26	16	13	16	23	286	100	112	18	8.1	11
27	26	26	16	13	17	22	296	95	122	18	7.3	10
28	24	26	16	13	17	21	337	93	109	18	7.6	10
29	25	26	15	13	------	20	406	95	97	18	7.6	10
30	26	25	15	14	------	19	462	98	88	17	8.9	11
31	29	------	15	14	------	19	------	100	------	16	9.5	------
TOTAL	908	846	576	405	431	608	6,662	4,945	3,360	1,197	334.0	303.1
MEAN	29.3	28.2	18.6	13.1	15.4	19.6	222	160	112	38.6	10.8	10.1
MAX	43	37	25	15	17	32	478	419	192	82	15	16
MIN	22	24	15	12	14	15	18	93	71	16	7.3	7.3
AC-FT	1,800	1,680	1,140	803	855	1,210	13,210	9,810	6,660	2,370	662	601

CAL YR 1969 TOTAL 28,063.2 MEAN 76.9 MAX 1,670 MIN 7.5 ACFT 55,660
WAT YR 1970 TOTAL 20,575.1 MEAN 56.4 MAX 478 MIN 7.3 ACFT 40,810

05061500 South Branch Buffalo River at Sabin, Minn.

LOCATION.--Lat 46°46'20", long 96°37'40", in SW¼SW¼ sec.9, T.138 N., R.47 W., Clay County, near center of span on downstream side of highway bridge, 0.3 mile downstream from Stony Creek and 1 mile east of Sabin.

DRAINAGE AREA.--522 sq mi.

PERIOD OF RECORD.--March 1945 to current year.

GAGE.--Nonrecording gage read once or twice daily and crest-stage gage. Datum of gage is 902.39 ft above mean sea level, datum of 1929 (levels by Soil Conservation Service). Prior to Aug. 17, 1948, nonrecording gage at site 1 mile downstream at different datum.

AVERAGE DISCHARGE.--25 years, 55.9 cfs (40,500 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 432 cfs Apr. 9 (gage height, 10.70 ft, from graph based on gage readings, backwater from ice); minimum, 0.1 cfs Sept. 8, 9.
Period of record: Maximum discharge, 6,410 cfs Apr. 10, 1969 (gage height, 18.12 ft); no flow for many days in most years.

REMARKS.--Records fair.

REVISIONS (WATER YEARS).--WSP 1308: 1949(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.6	18	8.5	2.4	1.8	1.3	20	166	49	35	.50	1.0
2	3.1	19	8.3	2.3	1.8	1.2	19	144	52	29	.70	1.6
3	2.6	20	8.1	2.2	1.8	1.0	19	120	52	24	1.0	1.6
4	3.8	20	7.9	2.2	1.8	.90	22	102	44	22	1.4	2.2
5	6.0	19	7.7	2.1	1.8	.80	50	90	39	18	1.5	2.5
6	6.5	19	7.6	2.0	1.8	.70	105	79	35	16	1.6	1.2
7	7.0	18	7.5	2.0	1.8	.70	200	72	33	14	1.6	.50
8	7.2	18	7.3	2.0	1.8	.60	400	66	31	12	1.9	.10
9	7.2	17	7.1	1.9	1.9	.60	420	60	27	11	1.7	.10
10	7.7	17	7.0	1.9	1.9	.60	375	57	25	10	1.5	.40
11	10	16	6.8	1.9	1.9	.60	330	55	23	8.6	1.0	.50
12	12	15	6.6	1.8	1.9	.60	210	54	23	7.5	1.4	.80
13	13	14	6.3	1.8	1.9	.60	132	52	23	6.7	1.6	.80
14	12	14	6.0	1.7	1.9	.60	114	51	29	6.0	2.3	.70
15	11	13	5.6	1.7	1.9	.60	99	51	46	5.0	2.2	1.6
16	12	11	5.2	1.7	1.9	.60	96	50	91	4.4	2.5	3.1
17	11	10	4.9	1.7	1.9	.60	92	49	76	3.7	2.8	2.1
18	10	9.0	4.6	1.7	1.9	.60	91	48	80	3.4	3.0	1.7
19	10	8.5	4.3	1.6	1.9	.60	96	44	99	3.2	2.3	1.7
20	10	8.3	4.1	1.6	2.0	.60	108	39	133	3.0	1.1	2.4
21	11	8.1	3.9	1.6	2.0	.60	155	38	149	2.2	.60	3.5
22	11	8.0	3.7	1.6	2.0	.70	211	34	134	1.6	.50	6.0
23	11	8.0	3.5	1.6	2.0	.80	242	34	112	1.4	.50	6.2
24	10	8.2	3.3	1.6	2.0	1.0	232	35	97	1.2	.50	4.1
25	9.5	8.3	3.2	1.7	1.9	2.0	207	36	85	1.3	.50	4.4
26	9.0	8.5	3.1	1.7	1.8	15	175	38	73	1.0	.40	3.2
27	8.8	8.7	2.9	1.7	1.7	60	155	47	64	.70	.30	2.8
28	8.5	8.8	2.8	1.7	1.5	70	161	48	55	.80	.30	2.5
29	9.5	8.8	2.7	1.7	------	55	163	50	48	1.0	.20	2.0
30	13	8.7	2.6	1.8	------	30	182	51	41	.90	.30	2.3
31	18	------	2.5	1.8	------	22	------	50	------	.60	.30	------
TOTAL	284.0	387.9	165.6	56.7	52.2	271.50	4,881	1,910	1,868	255.20	38.00	63.60
MEAN	9.16	12.9	5.34	1.83	1.86	8.76	163	61.6	62.3	8.23	1.23	2.12
MAX	18	20	8.5	2.4	2.0	70	420	166	149	35	3.0	6.2
MIN	2.6	8.0	2.5	1.6	1.5	.60	19	34	23	.60	.20	.10
AC-FT	563	769	328	112	104	539	9,680	3,790	3,710	506	75	126

CAL YR 1969 TOTAL 31,849.00 MEAN 87.3 MAX 6,230 MIN 0 AC-FT 63,170
WTR YR 1970 TOTAL 10,233.70 MEAN 28.0 MAX 420 MIN .10 AC-FT 20,300

05062000 Buffalo River near Dilworth, Minn.

LOCATION.--Lat 46°57'40", long 96°39'40", in SW¼SE¼ sec.6, T.140 N., R.47 W., Clay County, on left bank 4.5 miles southeast of Kragnes, 6.5 miles northeast of Dilworth, and 9 miles downstream from South Branch.

DRAINAGE AREA.--1,040 sq mi, approximately.

PERIOD OF RECORD.--March 1931 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 878.31 ft above mean sea level, datum of 1929 (levels by Corps of Engineers). Prior to Apr. 5, 1937, nonrecording gage at same site and datum.

AVERAGE DISCHARGE.--39 years, 124 cfs (89,840 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 802 cfs Apr. 12 (gage height, 12.85 ft, backwater from ice); minimum, 4.2 cfs Sept. 11, 12 (gage height, 1.80 ft).
Period of record: Maximum discharge, 10,400 cfs Apr. 11, 1969 (gage height, 25.55 ft); no flow at times in 1936.

REMARKS.--Records fair.

REVISIONS (WATER YEARS).--WSP 1308: 1931(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	36	30	21	18	20	185	543	170	145	15	8.9
2	11	38	29	21	18	20	170	548	177	130	13	8.1
3	14	42	29	21	18	20	145	537	183	116	12	7.1
4	27	49	28	21	18	20	130	495	181	106	12	7.5
5	35	50	28	21	18	20	150	437	165	98	10	6.9
6	37	55	28	21	18	20	220	385	149	89	9.3	5.9
7	40	53	27	21	18	19	310	338	134	81	9.1	6.1
8	41	51	27	20	18	19	430	299	145	73	8.7	5.9
9	44	56	27	20	18	19	580	271	141	66	9.1	5.4
10	46	53	27	20	18	18	680	253	120	57	10	5.0
11	47	52	27	20	18	18	750	244	111	52	9.8	4.5
12	47	48	27	19	18	18	770	235	105	48	9.6	4.6
13	44	44	27	19	18	18	690	226	108	47	9.6	5.0
14	47	40	26	19	18	18	570	219	112	44	10	5.0
15	48	37	26	19	18	18	463	213	143	44	10	5.9
16	45	35	26	19	18	18	387	215	308	41	10	7.1
17	42	34	26	19	18	18	335	216	624	37	11	8.5
18	39	33	25	18	18	18	306	209	691	33	9.8	9.6
19	36	33	25	18	18	19	298	195	551	31	9.3	9.3
20	35	34	25	18	18	20	327	180	423	29	8.5	12
21	35	35	24	18	19	22	493	171	382	27	8.5	26
22	30	35	24	18	19	25	594	162	361	24	7.9	16
23	28	34	23	18	19	30	542	156	339	23	7.7	18
24	30	34	23	18	19	40	497	153	304	22	7.3	14
25	30	35	22	18	19	70	474	153	265	21	6.9	14
26	32	36	22	18	20	82	450	155	232	20	6.5	15
27	32	36	22	18	20	86	449	156	202	20	6.3	13
28	34	35	22	18	20	90	569	158	190	19	5.4	11
29	32	33	21	18	------	135	656	162	181	17	5.4	9.6
30	36	31	21	18	------	180	565	162	162	16	7.1	8.3
31	38	------	21	18	------	190	------	169	------	17	7.3	------
TOTAL	1,092	1,217	785	593	515	1,328	13,185	8,015	7,359	1,593	282.1	283.2
MEAN	35.2	40.6	25.3	19.1	18.4	42.8	440	259	245	51.4	9.10	9.44
MAX	48	56	30	21	20	190	770	548	691	145	15	26
MIN	10	31	21	18	18	18	130	153	105	16	5.4	4.5
AC-FT	2,170	2,410	1,560	1,180	1,020	2,630	26,150	15,900	14,600	3,160	560	562

CAL YR 1969 TOTAL 74,213.9 MEAN 203 MAX 9,890 MIN 6.1 AC-FT 147,200
WTR YR 1970 TOTAL 36,247.3 MEAN 99.3 MAX 770 MIN 4.5 AC-FT 71,900

05062500 Wild Rice River at Twin Valley, Minn.

LOCATION.--Lat 47°16'00", long 96°14'40", in NE¼ sec.27, T.144 N., R.44 W., Norman County, on left bank 100 ft upstream from highway bridge, 0.8 mile northeast of village of Twin Valley, and 2 miles upstream from small tributary.

DRAINAGE AREA.--888 sq mi.

PERIOD OF RECORD.--June 1909 to September 1917, July 1930 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 1,008.16 ft above mean sea level, datum of 1929 (Corps of Engineers bench mark). June 1909 to September 1917, nonrecording gage at site a quarter of a mile downstream at different datum. July 23, 1930, to Nov. 24, 1934, nonrecording gage at highway bridge 100 ft downstream from present site at present datum. Nov. 25, 1934, to Aug. 2, 1950, water-stage recorder 80 ft upstream from present site at present datum.

AVERAGE DISCHARGE.--48 years, 167 cfs (121,000 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 1,740 cfs Apr. 30 (gage height, 7.97 ft); maximum gage height, 9.30 ft Apr. 8 (backwater from ice); minimum discharge, 11 cfs Sept. 13, 14; minimum gage height, 0.88 ft Sept. 14.
Period of record: Maximum discharge, 9,200 cfs July 22, 1909 (gage height, 20.0 ft, site and datum then in use), from rating curve extended above 3,300 cfs; minimum, 0.5 cfs Nov. 4, 1939.

REMARKS.--Records good except those for winter months, which are fair. Flow slightly regulated by Rice Lake and many other small lakes above station. Diurnal fluctuation caused by operation of mill at Faith, 17 miles above station.

REVISIONS (WATER YEARS).--WSP 955: 1941. WSP 1308: 1915(M), 1917(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	30	152	130	78	57	52	64	1,490	504	429	50	17
2	32	152	125	76	56	55	64	1,340	466	380	46	16
3	36	160	125	75	55	58	64	1,240	440	340	43	15
4	49	164	125	74	54	58	66	1,150	403	312	41	14
5	54	163	125	73	54	58	87	1,070	379	288	39	14
6	69	161	123	73	54	58	160	996	352	266	35	12
7	101	160	126	72	53	57	420	958	326	245	32	17
8	106	164	126	70	52	56	1,440	907	310	226	29	15
9	103	164	120	68	52	55	1,420	868	288	208	27	14
10	108	158	113	68	52	54	1,320	834	276	192	25	12
11	133	160	110	68	52	54	1,140	795	277	176	24	12
12	206	130	109	67	52	54	938	767	276	163	26	12
13	204	110	107	67	52	54	848	732	278	149	28	11
14	192	86	105	66	52	54	817	711	274	130	26	11
15	185	64	104	66	52	54	838	722	388	121	25	13
16	181	62	100	66	52	54	871	738	947	113	23	14
17	178	74	98	65	53	55	783	739	1,270	104	22	15
18	178	88	96	65	53	55	752	700	1,330	96	21	15
19	168	80	94	63	52	55	736	651	1,330	90	20	15
20	167	92	93	62	52	56	685	613	1,210	84	18	15
21	162	120	92	62	52	56	695	588	1,060	77	18	28
22	171	150	90	62	52	57	737	566	922	70	21	31
23	172	175	90	61	51	59	832	546	813	61	20	22
24	161	170	88	60	51	61	1,240	529	713	56	18	24
25	152	165	86	60	51	64	1,530	524	635	52	18	22
26	159	155	85	59	50	65	1,410	499	630	50	17	28
27	156	148	84	59	50	66	1,330	478	573	49	16	25
28	141	140	82	58	50	67	1,510	445	542	46	16	23
29	130	138	80	58	------	66	1,630	440	503	53	15	21
30	128	135	78	58	------	66	1,700	440	471	51	23	19
31	150	------	78	57	------	65	------	477	------	60	20	------
TOTAL	4,162	4,040	3,187	2,036	1,468	1,798	26,127	23,553	18,186	4,737	802	522
MEAN	134	135	103	65.7	52.4	58.0	871	760	606	153	25.9	17.4
MAX	206	175	130	78	57	67	1,700	1,490	1,330	429	50	31
MIN	30	62	78	57	50	52	64	440	274	46	15	11
AC-FT	8,260	8,010	6,320	4,040	2,910	3,570	51,820	46,720	36,070	9,400	1,590	1,040

CAL YR 1969 TOTAL 84,062 MEAN 230 MAX 4,230 MIN 18 ACFT 166,700
WAT YR 1970 TOTAL 90,618 MEAN 248 MAX 1,700 MIN 11 ACFT 179,700

05064000 Wild Rice River at Hendrum, Minn.

LOCATION.--Lat 47°16'05", long 96°47'50", in SE¼ sec.19, T.144 N., R.48 W., Norman County, near center of span on downstream side of highway bridge, 0.5 mile east of Hendrum and 4 miles upstream from mouth.

DRAINAGE AREA.--1,600 sq mi, approximately.

PERIOD OF RECORD.--March 1944 to current year.

GAGE.--Nonrecording gage and crest-stage gage. Datum of gage is 836.75 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

AVERAGE DISCHARGE.--26 years, 238 cfs (172,400 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 3,940 cfs June 20 (gage height, 22.41 ft, backwater from Red River of the North); minimum observed, 11 cfs Sept. 19 (gage height, 1.88 ft).
Period of record: Maximum discharge, 8,300 cfs Apr. 15, 1969 (gage height, 31.42 ft); no flow some days in 1948-49.

REMARKS.--Records fair. Large part of high flow diverted into Marsh River basin at overflow section 3.5 miles east of Ada. Another diversion into Marsh River basin, formed ~~1.5~~ 2.1 miles southeast of Ada, diverted water at all stages 1947-51, after which it was closed except for small regulated flow diverted at same point. Amount of diversion not known.

REVISIONS (WATER YEARS).--WSP 1728: 1958.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	29	164	144	82	57	51	74	2,380	1,570	514	70	25
2	36	170	140	80	57	51	73	2,040	1,460	482	69	26
3	46	179	137	79	58	54	73	1,730	1,070	455	62	21
4	62	185	136	78	59	57	80	1,540	796	427	58	18
5	66	190	132	76	59	60	116	1,440	638	392	56	18
6	90	195	131	75	58	60	200	1,340	553	350	55	15
7	100	193	130	74	57	60	400	1,280	540	309	51	22
8	113	188	126	73	56	58	800	1,210	530	293	46	30
9	138	187	119	72	55	57	2,200	1,160	481	275	42	26
10	144	190	118	71	55	57	2,880	1,110	450	260	41	21
11	152	197	117	71	55	57	2,760	1,080	417	245	37	18
12	168	182	115	70	54	56	2,480	1,060	388	230	37	22
13	220	176	112	70	54	56	1,760	1,000	396	215	36	20
14	213	155	109	70	53	56	1,290	962	391	204	35	19
15	204	138	108	69	53	56	1,070	981	567	186	34	21
16	197	128	107	69	52	55	1,210	1,030	1,340	169	33	19
17	193	125	105	69	52	55	1,170	1,120	2,690	162	32	18
18	180	135	103	68	51	55	1,030	1,040	3,540	152	32	16
19	197	155	100	67	52	55	987	930	3,850	138	31	13
20	169	160	98	66	52	56	979	852	3,890	124	29	15
21	175	140	97	65	52	56	1,100	792	3,360	115	28	24
22	194	145	96	64	52	57	1,690	762	2,500	107	29	35
23	192	165	94	63	52	58	2,130	740	1,850	101	29	32
24	194	192	92	62	52	58	2,180	705	1,330	94	29	42
25	196	214	91	61	52	60	2,360	681	1,070	89	28	42
26	188	200	93	61	51	62	2,550	673	916	80	25	29
27	177	188	90	60	51	65	2,460	671	880	79	24	26
28	170	170	88	59	51	68	2,090	620	859	78	22	29
29	164	158	87	59	------	71	2,220	630	738	76	21	29
30	159	150	86	58	------	73	2,480	641	642	73	19	22
31	159	------	85	57	------	74	------	1,000	------	71	19	------
TOTAL	4,685	5,114	3,386	2,118	1,512	1,824	42,892	33,200	39,702	6,545	1,159	713
MEAN	151	170	109	68.3	54.0	58.8	1,430	1,071	1,323	211	37.4	23.8
MAX	220	214	144	82	59	74	2,880	2,380	3,890	514	70	42
MIN	29	125	85	57	51	51	73	620	388	71	19	13
AC-FT	9,290	10,140	6,720	4,200	3,000	3,620	85,080	65,850	78,750	12,980	2,300	1,410

CAL YR 1969 TOTAL 127,116 MEAN 348 MAX 8,140 MIN 19 AC-FT 252,100
WTR YR 1970 TOTAL 142,850 MEAN 391 MAX 3,890 MIN 13 AC-FT 283,300

05064500 Red River of the North at Halstad, Minn.

LOCATION.--Lat 47°21'10", long 96°50'50", on line between secs.24 and 25, T.145 N., R.49 W., Traill County, on left bank on upstream side of highway bridge, 0.5 mile west of Halstad, 2.5 miles downstream from Wild Rice River, and at mile 375.2.

DRAINAGE AREA.--21,800 sq mi, approximately (includes 3,800 sq mi in closed basins).

PERIOD OF RECORD.--April 1936 to June 1937 (no winter records), April 1942 to September 1960 (spring and summer months only), May 1961 to current year.

GAGE.--Water-stage recorder. Datum of gage is 826.65 ft above mean sea level. Prior to July 17, 1961, nonrecording gage at same site and datum.

AVERAGE DISCHARGE.--9 years, 1,901 cfs (1,377,000 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 11,600 cfs Apr. 10 (gage height, 22.36 ft, backwater from ice); minimum, 113 cfs Sept. 16, 17 (gage height, 1.98 ft).
Period of record: Maximum discharge, 35,700 cfs Apr. 18, 1969 (gage height, 38.29 ft); minimum discharge observed, 5.4 cfs Oct. 8, 9, 12-14, 1936.
Flood in 1897 reached a stage of about 38.5 ft.

REMARKS.--Records good. Some regulation by many controlled lakes and reservoirs on tributaries.

REVISIONS(WATER YEARS).--WSP 1388: 1936, 1950. WSP 1728: Drainage area.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	208	471	400	295	340	425	1,190	6,620	8,620	2,680	404	192
2	223	474	400	295	340	420	1,200	5,900	8,540	2,500	380	183
3	231	492	400	295	335	450	1,240	5,200	7,580	2,340	372	148
4	236	498	400	295	335	470	1,200	4,620	6,480	2,180	370	126
5	246	501	380	295	333	520	1,300	4,230	5,130	2,020	362	117
6	300	516	350	295	330	530	2,000	3,910	3,930	1,880	359	130
7	328	522	340	300	325	490	3,950	3,640	3,230	1,780	357	148
8	317	522	340	310	325	485	7,640	3,390	2,920	1,680	352	201
9	314	522	340	320	330	485	10,300	3,170	2,740	1,560	326	201
10	341	525	340	325	330	490	11,400	3,060	2,540	1,430	269	169
11	344	528	340	330	335	495	10,600	2,990	2,310	1,310	224	157
12	358	510	340	340	340	500	9,040	2,920	2,110	1,210	222	174
13	378	504	340	345	340	510	7,260	2,810	1,980	1,150	339	160
14	423	456	330	350	340	515	5,910	2,710	1,920	1,130	380	135
15	417	450	330	350	340	510	5,040	2,690	2,060	1,090	352	124
16	399	460	330	360	340	500	4,640	2,770	3,980	1,030	319	117
17	387	460	320	370	345	490	4,480	2,890	7,380	974	292	115
18	384	470	320	365	350	500	4,100	2,840	8,880	917	267	126
19	372	465	320	365	375	510	3,650	2,710	9,400	841	241	132
20	369	460	320	360	390	520	3,350	2,540	9,360	790	213	126
21	399	465	320	360	410	530	3,730	2,430	8,960	747	208	132
22	441	460	320	360	410	535	6,280	2,370	7,800	690	203	180
23	459	460	320	355	415	540	8,690	2,300	6,260	599	196	407
24	468	460	320	355	415	570	9,560	2,250	5,000	540	196	342
25	489	450	315	355	420	580	9,530	2,210	4,320	534	185	286
26	504	430	310	350	420	620	9,000	2,210	3,910	546	167	267
27	495	420	305	350	425	690	8,120	2,240	3,680	546	153	233
28	486	420	300	350	425	780	7,170	2,270	3,460	531	148	208
29	486	410	300	350	------	940	6,770	3,240	3,130	516	146	185
30	486	405	300	350	------	1,100	6,990	4,800	2,870	486	137	167
31	477	------	295	340	------	1,130	------	6,370	------	440	141	------
TOTAL	11,765	14,186	10,385	10,435	10,158	17,830	175,330	104,300	150,480	36,667	8,280	5,388
MEAN	380	473	335	337	363	575	5,844	3,365	5,016	1,183	267	180
MAX	504	528	400	370	425	1,130	11,400	6,620	9,400	2,680	404	407
MIN	208	405	295	295	325	420	1,190	2,210	1,920	440	137	115
AC-FT	23,340	28,140	20,600	20,700	20,150	35,370	347,800	206,900	298,500	72,730	16,420	10,690

CAL YR 1969 TOTAL 1,059,876 MEAN 2,904 MAX 35,600 MIN 178 AC-FT 2,102,000
WTR YR 1970 TOTAL 555,204 MEAN 1,521 MAX 11,400 MIN 115 AC-FT 1,101,000

05067500 Marsh River near Shelly, Minn.

LOCATION.--Lat 47°24'45", long 96°45'50", in NE¼NW¼ sec.3, T.145 N., R.48 W., Norman County, near center of span on downstream truss of bridge, 3.8 miles southeast of Shelly and 10 miles upstream from mouth.

DRAINAGE AREA.--151 sq mi.

PERIOD OF RECORD.--March 1944 to current year. Monthly discharge only for March 1944, published in WSP 1308.

GAGE.--Nonrecording gage read once or twice daily and crest-stage gage. Datum of gage is 841.14 ft above mean sea level, datum of 1929 (levels by Corps of Engineers). Prior to Oct. 1, 1965, nonrecording gage at datum 3.0 ft higher.

AVERAGE DISCHARGE.--26 years, 78.2 cfs (56,700 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 1,320 cfs Apr. 9 (gage height, 13.38 ft); no flow Aug. 9 to Sept. 6, Sept. 17-30.
Period of record: Maximum discharge, 4,660 cfs May 11, 1950 (gage height, 21.96 ft, from floodmark, present datum); no flow for many days most years.

REMARKS.--Records fair. Large part of high flow of Wild Rice River diverted into Marsh River basin at overflow section 3.5 miles east of Ada. Another diversion from Wild Rice River, formed 2.1 miles southeast of Ada, supplemented flow at all stages 1947-51, after which it was closed except for small regulated flow diverted at same point for abatement of pollution from Ada sewage plant effluent.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.2	3.0	1.2	.30	.10	.20	2.6	156	92	12	.20	0
2	1.1	3.3	1.3	.30	.10	.20	2.8	114	88	9.0	.20	0
3	1.5	3.3	1.4	.30	.10	.20	3.5	83	89	7.5	.20	0
4	1.9	3.4	1.3	.30	.10	.20	7.0	65	61	6.3	.20	0
5	2.4	3.4	1.0	.20	.10	.20	20	57	44	5.5	.20	0
6	2.2	3.4	1.0	.20	.10	.20	60	48	33	4.5	.20	0
7	3.6	3.0	1.0	.20	.10	.20	230	42	27	3.7	.10	.30
8	4.0	2.9	.90	.20	.10	.20	900	36	23	3.1	.10	.90
9	4.5	7.1	.90	.20	.10	.20	1,280	34	20	2.0	0	1.1
10	6.1	5.5	.80	.20	.10	.20	926	36	18	1.8	0	.70
11	5.5	4.6	.80	.10	.10	.20	587	39	16	1.5	0	.40
12	4.5	3.8	.80	.10	.10	.20	373	43	14	1.0	0	.20
13	5.0	1.6	.80	.10	.10	.20	205	42	12	1.2	0	.20
14	4.5	1.4	.80	.10	.10	.20	134	47	11	2.7	0	.10
15	4.2	1.3	.80	.10	.10	.20	103	56	13	2.0	0	.10
16	3.8	1.2	.70	.10	.10	.20	202	123	46	1.9	0	.10
17	3.6	1.2	.70	.10	.10	.30	181	134	471	1.6	0	0
18	2.9	1.2	.70	.10	.10	.50	159	108	823	1.0	0	0
19	2.2	1.2	.70	.20	.10	2.1	114	80	699	.60	0	0
20	2.1	1.1	.70	.20	.10	3.0	102	59	468	.50	0	0
21	2.1	1.0	.70	.20	.10	3.5	212	44	332	.40	0	0
22	1.7	1.0	.60	.20	.10	4.0	814	39	240	.30	0	0
23	1.4	1.0	.60	.20	.40	4.3	1,020	33	180	.20	0	0
24	1.3	1.1	.50	.20	.60	4.6	803	31	110	.10	0	0
25	1.3	1.4	.50	.20	.50	4.0	570	29	61	.20	0	0
26	1.6	1.4	.50	.20	.40	3.3	434	28	37	.30	0	0
27	1.4	1.3	.50	.20	.30	2.8	295	25	34	.20	0	0
28	1.5	1.3	.40	.20	.30	2.6	247	33	28	.20	0	0
29	2.3	1.2	.40	.10	------	2.5	280	42	21	.40	0	0
30	3.3	1.1	.40	.10	------	2.5	244	35	17	.40	0	0
31	3.5	------	.40	.10	------	2.5	------	57	------	.20	0	------
TOTAL	88.2	68.7	23.80	5.50	4.70	45.70	10,510.9	1,798	4,128	72.30	1.40	4.10
MEAN	2.85	2.29	.77	.18	.17	1.47	350	58.0	138	2.33	.045	.14
MAX	6.1	7.1	1.4	.30	.60	4.6	1,280	156	823	12	.20	1.1
MIN	1.1	1.0	.40	.10	.10	.20	2.6	25	11	.10	0	0
AC-FT	175	136	47	11	9.3	91	20,850	3,570	8,190	143	2.8	8.1

CAL YR 1969 TOTAL 21,645.50 MEAN 59.3 MAX 3,800 MIN 0 AC-FT 42,930
WTR YR 1970 TOTAL 16,751.30 MEAN 45.9 MAX 1,280 MIN 0 AC-FT 33,230

05069000 Sandhill River at Climax, Minn.

LOCATION.--Lat 47°36'43", long 96°48'52", in NE¼NE¼ sec.30, T.148 N., R.48 W., Polk County, near center of span on downstream side of bridge on U.S. Highway 75 in Climax and 3.7 miles upstream from mouth.

PERIOD OF RECORD.--March 1943 to current year (winter records incomplete in some years). Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Nonrecording gage and crest-stage gage. Datum of gage is 820.10 ft above mean sea level, datum of 1929 (levels by Corps of Engineers). Prior to Oct. 1, 1966, nonrecording gage at site 3.2 miles upstream at datum 12.78 ft higher.

AVERAGE DISCHARGE.--24 years (1946-70), 66.6 cfs (48,250 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 1,980 cfs Apr. 16 (gage height, 13.64 ft); minimum, 9.1 cfs Sept. 4, 5, 6 (gage height, 4.89 ft).
Period of record: Maximum discharge, 4,560 cfs Apr. 14, 1965 (gage height, 17.81 ft, site and datum then in use); maximum gage height, 28.32 ft Apr. 17, 1969 (from floodmark, backwater from Red River of the North); minimum discharge not determined.

REMARKS.--Records good except those for winter months, which are fair.

REVISIONS (WATER YEARS).--WSP 1388: 1943(M), 1944, 1947(M). WSP 1728: 1951(M), 1960 (Average discharge).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	30	26	18	14	14	12	14	525	466	80	22	10
2	30	23	19	14	13	12	16	438	335	66	20	9.6
3	30	25	19	13	11	12	18	361	224	62	19	9.6
4	29	24	19	13	11	11	19	351	177	56	20	9.1
5	28	24	18	13	11	11	21	320	147	53	21	9.1
6	28	24	18	13	11	11	24	280	128	50	21	9.1
7	28	25	18	13	11	11	90	254	110	48	21	9.6
8	28	26	18	13	10	11	550	239	99	44	21	22
9	30	26	17	13	10	11	880	221	89	43	20	15
10	30	25	17	13	10	11	1,030	214	81	40	20	15
11	30	23	17	13	10	11	1,300	214	74	38	19	15
12	32	24	17	13	10	11	1,220	208	71	38	18	14
13	32	19	17	13	10	11	1,150	200	65	38	18	13
14	33	16	17	12	10	11	1,330	221	62	36	16	12
15	34	15	17	12	10	12	1,440	315	70	35	14	14
16	35	17	17	12	10	12	1,820	348	137	34	14	16
17	35	18	16	12	11	13	1,370	255	426	31	14	16
18	34	17	16	12	11	13	879	228	302	30	15	15
19	33	16	16	12	11	14	593	201	264	29	15	16
20	33	15	16	12	11	15	555	189	239	28	14	16
21	33	15	16	12	11	15	1,130	176	208	31	14	14
22	31	16	15	13	12	16	1,770	168	183	29	15	14
23	30	17	15	13	12	16	1,240	161	173	29	25	12
24	31	17	15	13	12	16	765	155	147	26	20	12
25	30	16	14	13	12	15	548	148	130	26	14	14
26	29	16	14	13	12	14	421	142	134	24	13	15
27	29	16	14	14	12	14	431	135	124	23	13	15
28	28	16	14	14	12	13	592	128	105	23	11	13
29	28	17	14	14	------	13	707	243	102	24	11	13
30	27	18	14	14	------	13	617	239	88	26	11	12
31	27	------	14	14	------	13	------	201	------	23	12	------
TOTAL	945	592	506	402	311	394	22,540	7,478	4,960	1,163	521	399.1
MEAN	30.5	19.7	16.3	13.0	11.1	12.7	751	241	165	37.5	16.8	13.3
MAX	35	26	19	14	14	16	1,820	525	466	80	25	22
MIN	27	15	14	12	10	11	14	128	62	23	11	9.1
AC-FT	1,870	1,170	1,000	797	617	782	44,710	14,830	9,840	2,310	1,030	792

CAL YR 1969 TOTAL 32,693.7 MEAN 89.6 MAX 3,850 MIN 4.5 AC-FT 64,850
WTR YR 1970 TOTAL 40,211.1 MEAN 110 MAX 1,820 MIN 9.1 AC-FT 79,760

05074000 Lower Red Lake near Red Lake, Minn.

LOCATION.--Lat 47°57'27", long 95°16'34", in NW¼ sec.28, T.152 N., R.36 W., Clearwater County, on left bank just upstream from dam at outlet, 13 miles northwest of village of Red Lake.

DRAINAGE AREA.--1,950 sq mi, approximately.

PERIOD OF RECORD.--June 1930 to November 1932 (published as Red Lake at Redby), May 1933 to current year (published as Red Lake near Red Lake 1933-40); records on Upper Red Lake published as Red Lake at Waskish, April 1930 to September 1933, all in reports of Geological Survey. October 1921 to September 1929 gage heights at Redby and on Upper Red Lake at Waskish in files of Minnesota Department of Conservation (fragmentary).

GAGE.--Water-stage recorder. Datum of gage is 1,169.00 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). May 1933 to Sept. 6, 1934, nonrecording gage at same site and datum. Nonrecording gages at Waskish and Redby at datum 69.00 ft lower.

EXTREMES.--Current year: Maximum gage height, 6.64 ft June 10 (affected by wind action); maximum daily, 6.47 ft June 12; minimum, 3.47 ft Nov. 19; minimum daily, 4.06 ft Nov. 19.
Period of record: Maximum gage height, 9.53 ft June 25, 1950; minimum recorded, 0.80 ft Nov. 20, 1936.

REMARKS.--Water level subject to fluctuation caused by change in direction and velocity of wind and by seiches.

MONTHEND GAGE HEIGHT, IN FEET, OCTOBER 1969 TO SEPTEMBER 1970

Oct. 31	5.42	Feb. 28	5.07	June 30	6.22
Nov. 20	4.82	Mar. 31	4.98	July 31	5.54
Dec. 31	5.32	Apr. 30	5.75	Aug. 31	5.19
Jan. 16	5.24	May 31	6.25	Sept.30	4.78

NOTE.--Mean daily gage heights are available.

05074500 Red Lake River near Red Lake, Minn.

LOCATION.--Lat 47°57'27", long 95°16'35", in NW¼ sec.28, T.152 N., R.36 W., Clearwater County, on left bank 50 ft downstream from dam at outlet of lower Red Lake and 13 miles northwest of village of Red Lake.

DRAINAGE AREA.--1,950 sq mi, approximately.

PERIOD OF RECORD.--May 1933 to current year. Monthly discharge only for May 1933, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 1,167.00 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). Prior to Sept. 7, 1934, nonrecording gage at site 50 ft upstream at datum 2.00 ft higher. Sept. 7, 1934, to Nov. 26, 1951, water-stage recorder at present site at datum 2.00 ft higher.

AVERAGE DISCHARGE.--37 years, 453 cfs (328,200 acre-ft per year).

EXTREMES.--Current year: Maximum daily discharge, 1,190 cfs Oct. 20, 21; maximum gage height, 7.02 ft July 31, Aug. 3 (affected by backwater from aquatic vegetation); minimum discharge, 141 cfs Apr. 19 (gage height, 1.74 ft).

Period of record: Maximum discharge, 3,600 cfs June 25, 1950 (gage height, 11.19 ft, affected by seiches and backwater from aquatic vegetation, present datum), from rating curve extended above 1,400 cfs; no flow at times.

REMARKS.--Records fair. Flow completely regulated by outlet dam on Lower Red Lake.

REVISIONS (WATER YEARS).--WSP 1308: 1934(M), 1943(M). WSP 1438: 1950(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1,020	1,140	1,060	889	900	800	680	254	988	1,080	833	796
2	1,030	1,130	1,030	870	950	790	658	243	972	1,070	867	841
3	1,040	1,130	968	890	950	820	676	258	980	1,040	878	841
4	1,070	1,120	942	900	930	820	662	390	1,000	1,020	874	852
5	1,110	1,110	923	920	905	820	658	759	996	999	800	859
6	1,100	1,100	908	920	884	810	666	848	999	988	637	856
7	1,110	1,100	889	915	860	805	488	942	996	984	592	911
8	1,100	1,100	889	914	840	840	249	938	999	972	640	923
9	1,100	1,100	885	913	830	820	200	938	996	968	782	923
10	1,140	1,110	878	905	820	815	164	965	1,000	961	808	856
11	1,140	1,120	867	900	820	815	167	965	1,020	953	822	785
12	1,140	1,120	852	895	820	825	167	976	1,020	934	822	767
13	1,150	1,110	863	890	820	840	167	980	1,040	923	826	759
14	1,150	1,100	856	880	850	859	175	999	1,050	908	826	767
15	1,160	1,080	856	880	840	878	175	1,040	1,060	893	796	778
16	1,180	1,080	867	890	830	889	193	1,070	1,010	856	796	778
17	1,180	1,070	848	900	820	848	194	1,090	804	844	804	778
18	1,180	1,060	848	905	860	822	180	1,090	767	844	789	785
19	1,180	1,060	859	925	890	804	157	1,030	844	826	785	796
20	1,190	1,070	889	940	900	808	175	1,020	999	789	774	804
21	1,190	1,080	878	945	870	796	184	1,020	1,040	767	778	800
22	1,180	1,100	911	935	860	800	180	999	1,070	745	778	782
23	1,160	1,140	972	920	840	808	198	999	1,100	727	774	819
24	1,160	1,160	934	910	830	793	203	996	1,140	702	770	830
25	1,170	1,170	957	900	870	808	225	1,100	1,140	709	759	837
26	1,180	1,180	930	890	860	815	227	1,050	1,180	723	759	844
27	1,160	1,180	942	880	840	988	221	988	1,150	730	745	852
28	1,140	1,160	923	890	805	882	220	1,010	1,140	738	741	856
29	1,140	1,130	908	910	------	800	243	1,020	1,120	738	748	856
30	1,130	1,100	915	890	------	770	272	1,020	1,110	782	759	867
31	1,130	------	900	880	------	680	------	999	------	833	767	------
TOTAL	35,210	33,410	28,147	27,991	24,094	25,468	9,024	27,996	30,730	27,046	24,125	24,798
MEAN	1,136	1,114	908	903	861	822	301	903	1,024	872	778	827
MAX	1,190	1,180	1,060	945	950	988	680	1,100	1,180	1,080	878	923
MIN	1,020	1,060	848	870	805	680	157	243	767	702	552	759
AC-FT	69,840	66,270	55,830	55,520	47,790	50,520	17,900	55,530	60,950	53,650	47,860	49,190

CAL YR 1969 TOTAL 358,833 MEAN 983 MAX 1,200 MIN 124 AC-FT 711,700
WTR YR 1970 TOTAL 318,043 MEAN 871 MAX 1,190 MIN 157 AC-FT 630,800

05075000 Red Lake River at High Landing, near Goodridge, Minn.

LOCATION.--Lat 48°02'34", long 95°48'28", on line between secs. 28 and 29, T.153 N., R.40 W., Pennington County, on left bank 50 ft upstream from highway bridge at High Landing, 7 miles south of Goodridge and 33 miles upstream from Thief River.

DRAINAGE AREA.--2,300 sq mi, approximately.

PERIOD OF RECORD.--September 1929 to current year. Prior to October 1930, published as "at Kratka".

GAGE.--Water-stage recorder. Datum of gage is 1,141.57 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). See WSP 1308 or 1738 for history of changes prior to Oct. 1, 1949.

AVERAGE DISCHARGE.--41 years, 486 cfs (352,100 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, about 2,120 cfs June 16 (gage height, about 9.90 ft); minimum, 395 cfs Apr. 9 (gage height, 3.67 ft).
Period of record: Maximum discharge, 3,720 cfs May 11, 1950 (gage height, 13.42 ft); no flow during infrequent periods in 1931-34, 1936-37.

REMARKS.--Records good except those for period of no gage-height record and those for winter months, which are fair. Flow regulated by outlet dam on Lower Red Lake.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1,280	1,260	1,080	980	920	900	905	1,070	1,350	1,150	747	945
2	1,280	1,260	1,100	970	960	895	885	992	1,320	1,110	770	951
3	1,290	1,260	1,080	960	960	890	860	920	1,310	1,070	794	966
4	1,310	1,250	1,040	950	940	890	880	864	1,280	1,070	824	994
5	1,350	1,240	1,000	940	920	890	905	1,010	1,260	1,060	845	1,020
6	1,380	1,230	990	940	920	890	900	1,260	1,250	1,050	851	1,040
7	1,360	1,220	980	940	920	905	780	1,290	1,230	1,020	813	1,080
8	1,330	1,210	980	940	910	910	640	1,360	1,220	1,000	752	1,150
9	1,320	1,200	970	950	905	920	424	1,420	1,200	989	699	1,170
10	1,330	1,200	970	960	900	915	448	1,420	1,210	968	679	1,170
11	1,360	1,180	970	970	900	905	446	1,420	1,240	960	711	1,160
12	1,350	1,170	960	975	905	900	564	1,420	1,240	943	752	1,120
13	1,350	1,100	920	975	910	895	630	1,390	1,240	926	782	1,060
14	1,340	930	900	970	920	900	710	1,390	1,230	906	805	1,020
15	1,320	770	920	970	920	905	820	1,460	1,220	903	816	1,010
16	1,320	880	950	960	915	910	840	1,560	1,600	873	835	997
17	1,310	960	970	950	910	915	835	1,530	1,940	835	840	986
18	1,310	1,010	970	950	910	915	810	1,460	1,510	821	843	974
19	1,300	1,050	960	960	915	900	797	1,420	1,210	840	845	963
20	1,300	1,100	950	970	920	880	601	1,400	1,130	840	845	954
21	1,310	1,150	970	980	910	865	557	1,380	1,150	818	845	951
22	1,300	1,190	960	980	910	860	589	1,370	1,130	797	884	943
23	1,300	1,200	980	970	915	860	692	1,350	1,110	781	906	926
24	1,290	1,190	1,020	960	920	860	1,200	1,340	1,080	768	906	926
25	1,280	1,150	1,050	940	900	865	1,690	1,310	1,100	747	901	934
26	1,290	1,100	1,050	920	920	870	1,480	1,300	1,180	744	895	943
27	1,270	1,070	1,030	920	930	880	1,280	1,320	1,210	742	898	943
28	1,260	1,050	1,010	920	920	900	1,260	1,330	1,210	739	901	943
29	1,260	1,040	1,000	920	------	940	1,270	1,350	1,180	739	912	943
30	1,260	1,050	990	920	------	950	1,150	1,350	1,170	739	926	945
31	1,260	------	980	915	------	960	------	1,340	------	731	937	------
TOTAL	40,570	33,670	30,700	29,525	25,705	27,840	25,848	40,796	37,710	27,679	25,759	30,127
MEAN	1,309	1,122	990	952	918	898	862	1,316	1,257	893	831	1,004
MAX	1,380	1,260	1,100	980	960	960	1,690	1,560	1,940	1,150	937	1,170
MIN	1,260	770	900	915	900	860	424	864	1,080	731	679	926
AC-FT	80,470	66,780	60,890	58,560	50,990	55,220	51,270	80,920	74,800	54,900	51,090	59,760

CAL YR 1969 TOTAL 414,272 MEAN 1,135 MAX 2,200 MIN 725 AC-FT 821,700
WTR YR 1970 TOTAL 375,929 MEAN 1,030 MAX 1,940 MIN 424 AC-FT 745,700

NOTE.--No gage-height record June 16, 17.

05076000 Thief River near Thief River Falls, Minn.

LOCATION.--Lat 48°11'08", long 96°10'11", in NW¼SW¼ sec.3, T.154 N., R.43 W., Marshall County, on right bank 0.2 mile upstream from highway bridge, 5 miles north of city of Thief River Falls, 7 miles upstream from mouth, and 9 miles downstream from Mud Lake National Wild Life Refuge.

DRAINAGE AREA.--959 sq mi.

PERIOD OF RECORD.--July 1909 to September 1917, April 1920 to September 1921, October 1922 to September 1924, October 1928 to current year. Monthly discharge only for some periods, annual maximums for water years 1919, 1922, 1925, 1926, published in WSP 1308.

GAGE.--Water-stage recorder and control of grouted boulders. Datum of gage is 1,112.33 ft above mean sea level, datum of 1929 (levels by Minnesota Highway Department). Prior to May 4, 1939, nonrecording gages at same site and datum.

AVERAGE DISCHARGE.--53 years, 154 cfs (111,600 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 2,820 cfs June 17 (gage height, 12.72 ft); no flow Jan. 13 to Apr. 8.
Period of record: Maximum discharge, 5,610 cfs May 13, 1950 (gage height, 17.38 ft); no flow at times in some years.

REMARKS.--Records good except those for winter periods, which are fair. Some regulation by Thief and Mud Lakes.

REVISIONS (WATER YEARS).--WSP 925: Drainage area. WSP 1308: 1917(M), 1924(M), 1929(M), 1931-33(M), 1935(M), 1937(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.68	504	.45	.19			0	770	1,200	1,460	5.6	4.5
2	.81	471	.42	.19			0	820	1,120	1,390	4.7	3.9
3	1.0	377	.41	.19			0	762	993	1,330	3.7	3.7
4	3.9	209	.36	.18			0	683	919	1,300	2.8	3.3
5	2.5	201	.34	.17			0	623	871	1,260	2.8	2.5
6	1.9	154	.40	.17			0	596	831	1,190	2.4	2.1
7	1.9	132	.51	.14			0	563	800	1,000	2.4	4.7
8	2.8	89	.58	.13			0	572	769	997	2.4	5.9
9	3.0	65	.62	.10			.2	700	540	882	2.4	5.2
10	2.9	54	.59	.10			1.0	818	447	554	2.4	4.5
11	4.0	33	.56	.10			30	848	564	394	1.9	3.0
12	4.9	22	.51	.10			80	851	658	136	1.7	2.0
13	4.8	16	.50	0			190	823	888	95	1.7	1.7
14	4.1	11	.51	0			460	723	822	87	1.6	7.0
15	4.9	9.0	.51	0			600	825	806	84	1.4	8.9
16	5.5	7.0	.50	0			1,100	1,020	1,330	95	1.4	5.6
17	5.2	5.6	.50	0			1,450	983	2,700	50	1.1	4.3
18	5.3	4.5	.51	0			1,600	723	2,760	35	1.6	3.6
19	5.1	3.5	.50	0			1,500	625	2,560	31	2.0	2.8
20	4.6	1.2	.43	0			1,360	574	2,400	26	1.5	2.5
21	4.5	.64	.32	0			661	592	2,340	22	2.3	2.0
22	162	.46	.26	0			496	816	2,200	19	4.6	1.8
23	349	.41	.21	0			733	834	1,900	16	4.1	1.9
24	380	.49	.21	0			1,300	815	1,720	24	2.3	2.2
25	483	.54	.21	0			1,710	814	1,600	17	2.3	4.9
26	507	.52	.21	0			1,600	847	1,550	13	1.6	6.2
27	471	.48	.22	0			1,300	767	1,540	11	1.8	4.4
28	624	.40	.21	0			1,210	741	1,480	9.0	1.6	3.8
29	633	.36	.20	0	------		1,240	1,070	1,460	9.3	2.0	4.4
30	618	.43	.20	0	------		1,040	1,110	1,480	7.7	7.4	4.7
31	558	------	.20	0	------		------	1,010	------	6.9	6.8	------
TOTAL	4,859.29	2,373.53	12.16	1.76	0	0	19,661.2	24,318	41,248	12,540.9	84.3	118.0
MEAN	157	79.1	.39	.057	0	0	655	784	1,375	405	2.72	3.93
MAX	633	504	.62	.19	0	0	1,710	1,110	2,760	1,460	7.4	8.9
MIN	.68	.36	.20	0	0	0	0	563	447	6.9	1.1	1.7
AC-FT	9,640	4,710	24	3.5	0	0	39,000	48,230	81,820	24,870	167	234

CAL YR 1969 TOTAL 100,833.61 MEAN 276 MAX 3,170 MIN .14 ACFT 200,000
WAT YR 1970 TOTAL 105,217.14 MEAN 288 MAX 2,760 MIN 0 ACFT 208,700

05077700 Ruffy Brook near Gonvick, Minn.

LOCATION.--Lat 47°44'50", long 95°24'45", on line between secs. 5 and 8, T.149 N., R.37 W., Clearwater County, on downstream side of bridge on County Highway 17, 4 miles upstream from mouth, and 4.8 miles east of Gonvick.

DRAINAGE AREA.--45.2 sq mi.

PERIOD OF RECORD.--April 1960 to current year. Monthly and daily figures for Apr. 1, 1960, to June 30, 1960, published in WSP 1913.

GAGE.--Nonrecording gage read once daily and crest-stage gage. Datum of gage is 1,227.93 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). Prior to Sept. 9, 1960, reference point at same site and datum.

AVERAGE DISCHARGE.--10 years, 14.7 cfs (10,650 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 279 cfs Apr. 29 (gage height, 5.28 ft); maximum gage height, 5.42 ft Apr. 8 (from floodmark, backwater from ice); minimum discharge, 0.7 cfs Aug. 27, 28.
Period of record: Maximum discharge, 453 cfs Mar. 30, 1967 (gage height, 6.35 ft, from graph based on gage readings); maximum gage height, 6.62 ft Apr. 9, 1969 (from graph based on gage readings, backwater from ice); no flow Feb. 20 to Mar. 6, 1968.

REMARKS.--Records good except those for winter months, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.2	20	6.0	5.1	4.1	4.6	5.2	117	15	9.3	1.6	1.4
2	5.4	20	5.9	5.1	4.1	4.6	5.2	96	13	8.5	1.2	1.4
3	5.0	20	5.9	5.1	4.1	4.5	5.1	83	12	7.6	.80	1.2
4	7.6	20	6.0	5.0	4.0	4.5	5.1	71	8.8	7.4	1.0	1.2
5	16	18	6.1	5.0	4.0	4.5	5.2	62	8.2	7.1	1.2	1.2
6	14	16	6.2	5.0	3.9	4.4	5.2	53	8.2	6.6	1.2	.80
7	9.6	14	6.3	4.9	3.8	4.3	5.4	47	7.1	5.9	1.2	3.9
8	9.6	13	6.4	4.9	3.8	4.3	25	40	6.6	5.9	1.2	2.2
9	8.5	12	6.4	4.8	3.8	4.2	75	34	6.2	5.0	1.4	1.8
10	34	11	6.4	4.8	3.7	4.2	120	30	9.6	4.8	1.2	1.4
11	32	10	6.3	4.8	3.7	4.2	130	26	11	4.1	1.2	1.4
12	23	9.2	6.2	4.8	3.7	4.2	119	26	13	3.9	.80	1.4
13	18	8.0	6.2	4.8	3.7	4.2	112	24	49	3.4	1.0	1.4
14	16	7.0	6.1	4.7	3.7	4.3	108	24	47	3.0	1.2	1.2
15	15	6.4	6.0	4.7	3.6	4.3	104	60	47	5.0	2.2	2.0
16	13	5.9	5.9	4.6	3.6	4.4	100	52	60	3.7	1.8	1.8
17	12	5.7	5.8	4.6	3.6	4.4	90	44	63	3.0	1.4	1.4
18	11	5.6	5.8	4.5	3.6	4.5	75	37	57	3.2	1.2	1.6
19	9.6	5.7	5.7	4.5	3.6	4.6	59	32	54	3.7	1.8	1.4
20	9.0	6.2	5.6	4.4	3.6	4.6	66	31	53	3.0	1.6	1.0
21	8.8	6.6	5.5	4.3	4.3	4.7	73	24	42	2.0	1.4	1.4
22	8.2	6.8	5.4	4.3	8.0	4.8	77	22	32	2.4	4.3	1.6
23	8.8	7.1	5.4	4.3	7.0	5.0	75	19	27	2.0	2.4	1.4
24	8.5	7.2	5.4	4.3	6.2	5.1	101	18	22	1.8	1.8	1.4
25	9.3	7.2	5.3	4.2	5.5	5.2	155	19	18	1.6	1.4	1.8
26	11	7.1	5.3	4.2	5.1	5.3	140	20	23	.70	1.0	1.6
27	9.6	6.8	5.3	4.2	4.8	5.4	126	18	19	1.6	.70	1.6
28	9.0	6.5	5.2	4.2	4.7	5.4	201	16	16	1.6	.70	1.6
29	9.9	6.2	5.2	4.1	------	5.3	246	18	12	1.8	1.2	1.6
30	12	6.0	5.2	4.1	------	5.3	162	16	10	1.6	1.2	1.6
31	15	------	5.1	4.1	------	5.2	------	15	------	1.6	1.4	------
TOTAL	383.6	301.2	179.5	142.4	121.3	144.5	2,574.4	1,194	769.7	122.80	43.70	46.70
MEAN	12.4	10.0	5.79	4.59	4.33	4.66	85.8	38.5	25.7	3.96	1.41	1.56
MAX	34	20	6.4	5.1	8.0	5.4	246	117	63	9.3	4.3	3.9
MIN	5.0	5.6	5.1	4.1	3.6	4.2	5.1	15	6.2	.70	.70	.80
AC-FT	761	597	356	282	241	287	5,110	2,370	1,530	244	87	93

CAL YR 1969 TOTAL 5,231.90 MEAN 14.3 MAX 205 MIN .70 ACFT 10,380
WAT YR 1970 TOTAL 6,023.80 MEAN 16.5 MAX 246 MIN .70 ACFT 11,950

PEAK DISCHARGE (BASE, 65 CFS)

DATE	TIME	G. H.	DISCHARGE	DATE	TIME	G. H.	DISCHARGE
4-11	0600	5.00	139	6-16	2200	2.53	67
4-29	0300	5.28	279				

05078000 Clearwater River at Plummer, Minn.

LOCATION.--Lat 47°55'24", long 96°02'46", in SE¼SW¼ sec.4, T.151 N., R.42 W., Red Lake County, on right bank 200 ft downstream from Soo Line Railroad bridge, 300 ft downstream from bridge on U. S. Highway 59, 0.9 mile northwest of railroad depot in Plummer, and 8 miles upstream from Hill River.

DRAINAGE AREA.--512 sq mi.

PERIOD OF RECORD.--April 1939 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,099.12 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). Prior to Nov. 10, 1939, nonrecording gage at site 100 ft upstream at same datum.

AVERAGE DISCHARGE.--31 years, 177 cfs (128,200 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 2,080 cfs Apr. 26 (gage height, 9.48 ft); minimum, 32 cfs Sept. 5 (gage height, 2.45 ft).
Period of record: Maximum discharge, 3,640 cfs June 9, 1962 (gage height, 11.90 ft); maximum gage height, 12.31 ft Apr. 10, 1969 (backwater from ice); minimum discharge, 7.9 cfs July 8, 1940.

REMARKS.--Records good except those for winter months, which are fair. Slight regulation by Clearwater Lake.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	81	176	94	76	92	49	50	1,380	367	212	47	37
2	90	195	98	76	91	49	51	1,250	304	191	53	35
3	98	213	98	76	90	48	52	1,100	254	166	62	34
4	104	212	97	76	88	48	54	974	226	148	53	33
5	118	209	95	76	86	48	57	874	202	143	46	33
6	183	203	94	76	84	47	64	791	181	134	44	33
7	218	196	93	77	81	47	77	702	162	124	42	39
8	214	190	92	77	79	47	106	616	147	118	40	51
9	204	183	91	78	77	46	168	563	140	110	40	63
10	205	175	90	78	75	46	228	511	135	99	44	50
11	243	169	89	79	73	46	314	470	148	84	45	45
12	307	162	88	80	70	46	440	441	169	83	47	42
13	304	145	87	82	68	46	690	446	190	78	43	38
14	280	70	86	83	66	45	920	502	193	74	48	38
15	263	84	85	84	64	45	1,120	640	199	74	42	37
16	248	102	84	85	62	45	1,260	817	368	80	40	37
17	239	108	84	87	61	45	1,440	877	891	83	47	39
18	228	117	83	89	60	45	1,360	791	1,030	80	43	40
19	221	116	82	90	59	45	1,070	678	764	74	38	40
20	212	114	82	91	58	46	781	607	525	74	35	41
21	206	111	81	92	56	46	625	568	441	78	40	40
22	196	113	80	92	55	46	632	532	371	73	45	37
23	187	118	80	93	54	46	727	488	313	59	47	42
24	180	114	79	94	53	46	989	460	271	59	53	46
25	178	109	78	94	52	46	1,730	443	243	55	46	50
26	177	104	78	94	51	47	1,960	441	294	51	43	50
27	185	102	77	94	50	47	1,570	427	373	46	41	50
28	191	97	77	94	50	48	1,360	347	322	51	39	49
29	176	96	77	94	------	48	1,420	320	273	49	39	50
30	170	95	77	94	------	49	1,470	375	236	50	38	48
31	169	------	77	93	------	49	------	352	------	52	38	------
TOTAL	6,075	4,198	2,653	2,644	1,905	1,447	22,785	19,783	9,732	2,852	1,368	1,267
MEAN	196	140	85.6	85.3	68.0	46.7	760	638	324	92.0	44.1	42.2
MAX	307	213	98	94	92	49	1,960	1,380	1,030	212	62	63
MIN	81	70	77	76	50	45	50	320	135	46	35	33
AC-FT	12,050	8,330	5,260	5,240	3,780	2,870	45,190	39,240	19,300	5,660	2,710	2,510

CAL YR 1969 TOTAL 81,356 MEAN 223 MAX 3,550 MIN 32 AC-FT 161,400
WTR YR 1970 TOTAL 76,709 MEAN 210 MAX 1,960 MIN 33 AC-FT 152,200

PEAK DISCHARGE (BASE, 500 CFS)

DATE	TIME	G. H.	DISCHARGE	DATE	TIME	G. H.	DISCHARGE
4-17	1215	8.23	1,480	5-17	0500	6.53	887
4-26	0215	9.48	2,080	6-18	0530	7.14	1,080
4-30	0415	8.26	1,500				

05078230 Lost River at Oklee, Minn.

LOCATION.--Lat 47°50'35", long 95°51'30", on west edge of sec.1, T.150 N., R.41 W., Red Lake County, on downstream side of bridge on State Highway 222 at northwest edge of Oklee, 12 miles upstream from mouth.

DRAINAGE AREA.--266 sq mi.

PERIOD OF RECORD.--April 1960 to current year. Monthly and daily figures for April 1, 1960 to June 30, 1960, published in WSP 1913.

GAGE.--Nonrecording gage read once or twice daily and crest-stage gage. Datum of gage is 1,126.94 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). Prior to Sept. 9, 1960, reference points at same site at datum 8.00 ft higher. Sept. 9, 1960, to Sept. 30, 1964, nonrecording gage at same site at datum 8.00 ft higher.

AVERAGE DISCHARGE.--10 years, 77.6 cfs (56,220 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 2,300 cfs Apr. 25 (gage height, 12.76 ft); minimum observed, 1.5 cfs Aug. 28, 29 (gage height, 2.43 ft).

Period of record: Maximum discharge, 3,210 cfs Apr. 11, 1969 (gage height, 14.91 ft, from floodmark); no flow Feb. 16 to Mar. 21, 1963, Feb. 15 to Mar. 2, 1964.

Maximum stage known since at least 1897, 18.39 ft Apr. 21, 1950 (present datum), from floodmarks (discharge, 2,790 cfs).

REMARKS.--Records good except those for winter months, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	108	28	15	9.8	12	12	525	118	55	4.5	3.5
2	20	112	27	14	9.8	12	12	444	117	50	8.6	3.3
3	54	142	27	14	9.6	12	12	399	113	36	8.4	3.0
4	83	141	28	14	9.6	12	12	326	109	18	4.2	2.4
5	156	138	28	14	9.4	11	13	274	107	9.1	3.6	1.9
6	161	101	28	14	9.4	11	14	236	103	6.4	3.4	1.7
7	143	89	28	13	9.4	11	20	227	75	6.2	3.3	2.6
8	128	78	27	13	9.2	11	70	206	67	5.3	3.1	25
9	104	70	26	13	9.2	10	390	205	45	4.7	2.4	26
10	120	56	25	13	9.2	10	765	200	45	4.4	2.2	24
11	143	47	24	13	9.2	10	870	197	45	4.4	2.8	20
12	154	43	23	13	9.0	10	800	192	45	3.9	2.4	18
13	166	37	22	13	9.0	10	750	154	39	3.7	2.1	16
14	143	33	22	13	9.0	11	715	174	106	3.6	1.9	10
15	126	31	21	13	9.0	11	670	384	234	3.6	2.5	4.7
16	66	29	20	13	9.0	11	625	524	409	4.9	3.0	4.7
17	56	28	20	12	9.2	11	591	384	610	4.5	2.4	4.7
18	51	28	19	12	9.2	11	470	287	353	4.5	2.0	4.4
19	49	28	18	12	9.4	12	353	229	276	4.1	2.5	4.2
20	45	29	18	12	9.4	12	274	188	190	3.7	2.3	4.1
21	44	30	17	11	9.6	12	283	172	114	3.4	2.2	4.1
22	42	30	17	11	9.6	12	342	161	99	3.4	5.8	4.1
23	41	31	17	11	9.8	12	534	151	85	3.3	4.9	4.2
24	32	32	17	11	10	13	1,330	136	63	3.3	3.7	4.2
25	21	32	16	11	10	13	2,180	127	54	3.3	2.4	4.2
26	17	31	16	10	11	13	1,580	138	93	3.3	2.1	4.4
27	17	30	16	10	11	13	874	130	93	3.0	1.6	3.6
28	35	30	16	10	11	13	880	120	89	3.0	1.5	3.6
29	38	29	15	10	------	13	1,000	130	75	3.0	1.5	3.6
30	51	28	15	10	------	12	692	135	55	3.0	1.7	3.6
31	66	------	15	10	------	12	------	129	------	4.2	2.3	------
TOTAL	2,392	1,671	656	378	268.0	359	17,133	7,284	4,026	272.2	97.3	223.8
MEAN	77.2	55.7	21.2	12.2	9.57	11.6	571	235	134	8.78	3.14	7.46
MAX	166	142	28	15	11	13	2,180	525	610	55	8.6	26
MIN	17	28	15	10	9.0	10	12	120	39	3.0	1.5	1.7
AC-FT	4,740	3,310	1,300	750	532	712	33,980	14,450	7,990	540	193	444

CAL YR 1969 TOTAL 32,559.5 MEAN 89.2 MAX 3,040 MIN 1.0 ACFT 64,580
WAT YR 1970 TOTAL 34,760.3 MEAN 95.2 MAX 2,180 MIN 1.5 ACFT 68,950

05078500 Clearwater River at Red Lake Falls, Minn.

LOCATION.--Lat 47°53'15", long 96°16'25", in NW¼NE¼ sec.22, T.151 N., R.44 W., Red Lake County, on left bank 40 ft downstream from Great Northern Railroad bridge in Red Lake Falls, 1.4 miles upstream from mouth, and 3 miles downstream from Badger Creek.

DRAINAGE AREA.--1,370 sq mi, approximately.

PERIOD OF RECORD.--June 1909 to September 1917, October 1934 to current year. Monthly discharge only for October, November, 1934, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 949.49 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). Prior to Sept. 12, 1911, nonrecording gage at site 0.5 mile upstream and Sept. 12, 1911, to Sept. 30, 1917, nonrecording gage at site 40 ft upstream at different datum.

AVERAGE DISCHARGE.--44 years, 305 cfs (221,000 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 5,630 cfs Apr. 26 (gage height, 9.32 ft); maximum gage height, 13.97 ft Apr. 11 (from floodmark, backwater from ice); minimum discharge, 34 cfs Aug. 20, 21, Sept. 6, 7 (gage height, 1.74 ft).
Period of record: Maximum discharge, 9,740 cfs Apr. 12, 1969 (gage height, 11.82 ft); maximum gage height observed, 17.5 ft Apr. 5, 1913, site and datum then in use (backwater from ice); no flow Sept. 15, 1936, Sept. 14, 1939, Aug. 19-22, 1940.

REMARKS.--Records good except those for winter months, which are fair. Slight regulation by Clearwater Lake and several smaller lakes.

REVISIONS (WATER YEARS).--WSP 355: 1911-12. WSP 1438: 1910-11, 1917(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	96	267	140	123	138	79	74	2,870	1,210	402	83	47
2	107	298	142	123	134	78	73	2,500	895	362	70	48
3	132	343	150	122	129	78	72	2,180	701	319	67	45
4	149	363	165	122	127	78	72	1,920	595	286	78	41
5	159	367	152	122	122	78	73	1,680	524	263	70	37
6	196	347	150	121	118	78	74	1,500	459	251	60	35
7	318	332	148	121	113	77	82	1,370	403	237	54	46
8	352	320	147	121	109	77	180	1,240	357	216	50	54
9	337	312	145	122	106	77	800	1,150	319	203	46	77
10	328	298	143	123	102	77	1,450	1,100	300	187	45	100
11	340	283	142	124	99	77	2,000	1,070	304	171	45	79
12	479	270	141	126	96	76	2,450	1,010	306	153	46	66
13	534	254	140	128	94	76	2,700	959	332	147	47	58
14	485	148	139	130	92	76	2,950	997	353	133	45	51
15	437	107	137	132	90	75	3,110	1,530	406	136	45	52
16	399	127	136	133	88	75	3,510	2,160	666	120	44	51
17	367	162	134	135	87	74	3,220	2,040	2,480	117	39	49
18	352	177	132	137	85	74	2,910	1,670	2,870	121	42	51
19	327	173	130	140	84	73	2,500	1,380	2,080	114	48	53
20	303	170	129	142	83	72	1,840	1,200	1,380	102	38	50
21	289	163	128	145	82	72	1,560	1,090	1,100	96	44	51
22	275	161	127	148	82	73	1,610	1,030	903	98	70	50
23	257	167	127	150	81	73	2,080	952	742	96	60	47
24	245	178	127	150	80	73	3,310	887	618	82	55	48
25	242	176	126	151	79	74	5,160	857	534	80	71	61
26	245	168	125	151	79	74	5,250	836	502	73	61	63
27	245	157	124	151	79	75	4,140	821	618	68	54	63
28	242	150	123	150	79	80	3,540	772	625	59	54	66
29	267	142	123	148	------	82	3,380	793	532	65	52	68
30	260	140	123	147	------	80	3,290	1,040	465	88	51	76
31	260	------	123	142	------	76	------	1,310	------	87	49	------
TOTAL	9,024	6,720	4,217	4,180	2,737	2,357	63,460	41,914	23,579	4,932	1,683	1,683
MEAN	291	224	136	135	97.8	76.0	2,115	1,352	786	159	54.3	56.1
MAX	534	367	165	151	138	82	5,250	2,870	2,870	402	83	100
MIN	96	107	123	121	79	72	72	772	300	59	38	35
AC-FT	17,900	13,330	8,360	8,290	5,430	4,680	125,900	83,140	46,770	9,780	3,340	3,340

CAL YR 1969 TOTAL 155,993 MEAN 427 MAX 9,010 MIN 60 ACFT 309,400
WAT YR 1970 TOTAL 166,496 MEAN 456 MAX 5,250 MIN 35 ACFT 330,200

05079000 Red Lake River at Crookston, Minn.

LOCATION.--Lat 47°46'32", long 96°36'33", in SW¼SW¼ sec.30, T.150 N., R.46 W., Polk County, on right bank at downstream side of highway bridge in Crookston, 0.3 mile downstream from Interstate Power Co.'s dam, 0.6 mile downstream from bridge on U.S. Highway 75, and 53 miles above mouth.

DRAINAGE AREA.--5,280 sq mi, approximately.

PERIOD OF RECORD.--May 1901 to current year. Monthly discharge only for some periods, published in WSP 1308. Figures of daily discharge for Apr. 3-30, 1904, published in WSP 130, have been found unreliable and should not be used.

GAGE.--Water-stage recorder. Datum of gage is 832.72 ft above mean sea level, datum of 1929. May 18, 1901, to June 30, 1909, nonrecording gage at bridge 300 ft upstream at same datum. July 1, 1909, to Sept. 25, 1911, nonrecording gage, Sept. 26, 1911, to Sept. 30, 1919, water-stage recorder, Oct. 1, 1919, to Sept. 30, 1930, nonrecording gage, at present site and datum.

AVERAGE DISCHARGE.--69 years, 1,069 cfs (774,500 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 13,300 cfs Apr. 26 (gage height, 19.05 ft); maximum gage height, 19.43 ft Apr. 18 (backwater from ice); minimum discharge, 571 cfs Nov. 18 (gage height, 4.01 ft).
Period of record: Maximum discharge, 28,400 cfs Apr. 12, 1969 (gage height, 27.33 ft); no flow for part of July 13, 1960 (caused by regulation of power plant upstream).

REMARKS.--Records good except those for winter months, which are fair. Diurnal fluctuation caused by power plant upstream.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1,350	2,210	970	1,160	1,080	1,030	1,090	6,280	6,250	3,120	812	880
2	1,350	2,190	990	1,150	1,040	1,080	1,050	5,190	5,140	3,020	804	885
3	1,360	2,180	1,020	1,140	1,010	1,110	887	4,720	4,130	2,880	771	897
4	1,440	2,150	1,030	1,120	1,000	1,070	904	4,260	3,510	2,750	821	888
5	1,460	1,950	1,050	1,100	1,020	1,040	853	3,850	3,130	2,700	823	906
6	1,500	1,920	1,100	1,080	1,060	1,030	854	3,510	2,870	2,620	830	910
7	1,600	1,820	1,130	1,070	1,070	1,030	951	3,590	2,660	2,540	829	992
8	1,750	1,800	1,110	1,060	1,070	1,020	2,100	3,470	2,540	2,300	835	1,020
9	1,740	1,720	1,070	1,090	1,060	1,010	3,140	3,370	2,430	2,220	807	1,040
10	1,700	1,660	1,030	1,110	1,060	1,010	4,070	3,520	2,160	2,130	744	1,100
11	1,740	1,660	1,010	1,120	1,050	1,000	4,820	3,610	1,990	1,710	709	1,120
12	1,810	1,600	1,000	1,130	1,050	1,010	5,550	3,580	2,130	1,530	686	1,130
13	1,930	1,550	1,000	1,120	1,040	1,020	6,360	3,500	2,490	1,230	692	1,070
14	1,950	1,300	1,020	1,100	1,040	1,020	7,020	3,460	2,570	1,100	738	1,040
15	1,860	978	1,030	1,100	1,030	1,030	7,220	3,870	2,550	1,070	763	1,010
16	1,820	836	900	1,100	1,030	1,030	7,800	4,940	2,760	1,130	776	1,010
17	1,730	730	840	1,100	1,030	1,020	8,740	5,380	5,310	1,060	776	955
18	1,720	670	910	1,110	1,020	1,020	9,000	4,890	9,870	1,030	786	950
19	1,690	650	1,000	1,120	1,020	1,010	7,640	4,120	9,650	990	815	930
20	1,680	660	1,080	1,130	1,020	1,000	5,590	3,600	7,320	936	806	943
21	1,640	670	1,110	1,140	1,030	1,000	4,470	3,330	5,800	931	807	936
22	1,720	700	1,150	1,150	1,050	1,020	4,630	3,200	5,170	907	909	913
23	1,640	730	1,140	1,150	1,040	1,040	5,680	3,320	4,630	888	903	906
24	1,950	950	1,130	1,140	1,040	1,070	7,830	3,250	4,070	888	855	898
25	2,000	1,080	1,120	1,130	1,030	1,050	10,900	3,160	3,680	864	868	928
26	2,140	1,150	1,100	1,120	1,020	1,080	13,100	3,120	3,440	850	880	941
27	2,160	1,200	1,180	1,110	1,000	1,150	11,500	3,060	3,400	841	866	946
28	2,100	1,170	1,200	1,110	1,000	1,130	8,710	2,980	3,540	827	864	939
29	2,260	1,120	1,220	1,100	------	1,000	7,970	3,210	3,400	827	878	942
30	2,310	980	1,210	1,090	------	975	7,410	4,420	3,240	850	878	936
31	2,290	------	1,180	1,080	------	1,090	------	4,830	------	841	881	------
TOTAL	55,390	39,984	33,030	34,530	29,010	32,195	167,839	120,590	121,830	47,580	25,212	28,961
MEAN	1,787	1,333	1,065	1,114	1,036	1,039	5,595	3,890	4,061	1,535	813	965
MAX	2,310	2,210	1,220	1,160	1,080	1,150	13,100	6,280	9,870	3,120	909	1,130
MIN	1,350	650	840	1,060	1,000	975	853	2,980	1,990	827	686	880
AC-FT	109,900	79,310	65,520	68,490	57,540	63,860	332,900	239,200	241,600	94,370	50,010	57,440

CAL YR 1969 TOTAL 751,137 MEAN 2,058 MAX 27,100 MIN 650 ACFT 1,490,000
WAT YR 1970 TOTAL 736,151 MEAN 2,017 MAX 13,100 MIN 650 ACFT 1,460,000

05082500 Red River of the North at Grand Forks, N. Dak.

LOCATION.--Lat 47°56'34", long 97°03'10", in SW¼NE¼ sec.33, T.152 N., R.50 W., Grand Forks County, on left bank on second floor of old sewage plant in Grand Forks, 2.3 miles downstream from Red Lake River, and at mile 296.0.

DRAINAGE AREA.--30,100 sq mi, approximately (includes 3,800 sq mi in closed basins).

PERIOD OF RECORD.--April 1882 to current year. Monthly discharge only prior to May 1901, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 778.35 ft above mean sea level. Nov. 3, 1933, to Apr. 13, 1965, water-stage recorder 0.3 mile upstream at present datum. See WSP 1728 or 1913 for history of changes prior to Nov. 3, 1933.

AVERAGE DISCHARGE.--88 years, 2,439 cfs (1,767,000 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 23,700 cfs Apr. 28 (gage height, 34.30 ft); maximum gage height, 34.42 ft Apr. 13; minimum discharge, 868 cfs Aug. 14 (gage height, 5.08 ft).
Period of record: Maximum discharge about 80,000 cfs Apr. 10, 1897 (gage height, 50.2 ft, site and datum then in use), from rating curve extended above 54,000 cfs; minimum, 2.4 cfs Feb. 3-5, 12, 14, 16-19, 1937 (caused by unusual regulation during repair of dam at Grand Forks).

REMARKS.--Records good. Flow regulated by many lakes and reservoirs on tributaries. Records of chemical analyses and water temperatures for the water year 1970 are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 855: 1936(M). WSP 1115: 1942. WSP 1175: 1897(M). WSP 1388: 1904, 1914-15, 1917-19, 1921-22, 1927, 1950. WSP 1728: Drainage area.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1,460	2,490	1,650	1,400	1,500	1,600	2,300	17,800	11,500	6,310	1,350	984
2	1,490	2,470	1,650	1,400	1,500	1,600	2,400	16,200	14,100	5,870	1,270	984
3	1,510	2,420	1,650	1,400	1,500	1,600	2,500	14,300	14,800	5,550	1,220	1,020
4	1,540	2,400	1,600	1,400	1,500	1,600	2,400	12,400	13,600	5,220	1,180	1,050
5	1,580	2,400	1,600	1,400	1,450	1,600	2,400	10,600	11,500	4,900	1,180	1,020
6	1,610	2,320	1,600	1,400	1,450	1,600	2,400	9,200	9,500	4,620	1,200	992
7	1,650	2,250	1,600	1,350	1,450	1,600	2,800	8,300	8,000	4,380	1,190	1,110
8	1,740	2,200	1,650	1,350	1,500	1,600	5,500	7,800	6,920	4,160	1,200	1,160
9	1,840	2,160	1,650	1,300	1,500	1,600	10,600	7,400	6,040	3,860	1,190	1,190
10	1,920	2,110	1,650	1,300	1,500	1,600	13,800	7,100	5,560	3,620	1,170	1,240
11	1,940	2,060	1,600	1,350	1,550	1,600	16,400	6,900	5,100	3,430	1,100	1,270
12	1,940	2,030	1,550	1,350	1,550	1,600	18,800	6,800	4,640	3,100	1,000	1,300
13	1,960	1,990	1,450	1,400	1,550	1,600	20,500	6,700	4,420	2,790	914	1,300
14	2,040	1,900	1,450	1,400	1,550	1,600	20,300	6,650	4,460	2,540	903	1,320
15	2,120	1,710	1,500	1,400	1,550	1,650	19,200	6,650	4,570	2,380	980	1,310
16	2,130	1,490	1,450	1,450	1,500	1,650	18,200	7,150	4,860	2,210	1,060	1,260
17	2,100	1,360	1,400	1,450	1,500	1,650	18,000	8,200	7,450	2,160	1,090	1,190
18	2,020	1,220	1,300	1,450	1,550	1,600	17,500	8,800	12,100	2,070	1,060	1,140
19	1,990	1,140	1,300	1,450	1,550	1,600	17,200	8,600	15,500	1,980	1,030	1,110
20	1,970	1,140	1,400	1,450	1,550	1,600	16,100	7,600	17,000	1,890	1,030	1,100
21	1,930	1,260	1,400	1,450	1,550	1,600	14,700	6,800	17,400	1,780	1,050	1,090
22	1,900	1,280	1,450	1,450	1,600	1,600	14,600	6,590	16,800	1,700	1,060	1,080
23	1,930	1,280	1,400	1,450	1,600	1,650	16,800	6,140	15,200	1,660	1,070	1,080
24	2,000	1,300	1,350	1,400	1,600	1,650	18,800	5,970	13,100	1,580	1,130	1,100
25	2,060	1,400	1,350	1,400	1,600	1,700	20,800	5,830	10,800	1,510	1,060	1,280
26	2,220	1,600	1,400	1,450	1,600	1,800	22,700	5,660	9,200	1,440	1,060	1,280
27	2,340	1,750	1,350	1,450	1,600	1,850	23,500	5,510	8,100	1,430	1,040	1,240
28	2,380	1,800	1,300	1,450	1,600	1,900	23,600	5,450	7,500	1,420	1,030	1,220
29	2,360	1,800	1,350	1,450	------	1,950	20,600	5,900	7,200	1,460	992	1,180
30	2,400	1,750	1,400	1,450	------	2,000	19,100	7,120	6,820	1,420	996	1,160
31	2,470	------	1,400	1,500	------	2,100	------	9,150	------	1,380	1,020	------
TOTAL	60,540	54,480	45,850	43,750	43,000	51,950	424,500	255,270	293,740	89,820	33,825	34,760
MEAN	1,953	1,816	1,479	1,411	1,536	1,676	14,150	8,235	9,791	2,897	1,091	1,159
MAX	2,470	2,490	1,650	1,500	1,600	2,100	23,600	17,800	17,400	6,310	1,350	1,320
MIN	1,460	1,140	1,300	1,300	1,450	1,600	2,300	5,450	4,420	1,380	903	984
AC-FT	120,100	108,100	90,940	86,780	85,290	103,000	842,000	506,300	582,600	178,200	67,090	68,950

CAL YR 1969 TOTAL 1,875,400 MEAN 5,138 MAX 53,400 MIN 1,060 AC-FT 3,720,000
WTR YR 1970 TOTAL 1,431,485 MEAN 3,922 MAX 23,600 MIN 903 AC-FT 2,839,000

05087500 Middle River at Argyle, Minn.

LOCATION.--Lat 48°20'27", long 96°49'02", in SE¼SW¼ sec.10, T.156 N., R.48 W., Marshall County, on left bank 20 ft upstream from bridge on U.S. Highway 75 in Argyle and 14 miles upstream from mouth.

DRAINAGE AREA.--265 sq mi.

PERIOD OF RECORD.--March to September 1945, October 1950 to current year. Monthly discharge only for some periods, published in WSP 1728.

GAGE.--Water-stage recorder. Datum of gage is 828.53 ft above mean sea level, datum of 1929. Prior to Nov. 8, 1951, nonrecording gages and Nov. 8, 1951, to Sept. 18, 1952, water-stage recorder at present site at datum 1.0 ft higher.

AVERAGE DISCHARGE.--20 years (1950-70), 46.0 cfs (33,330 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 2,200 cfs May 31 (gage height, 14.82 ft); no flow for many days.
Period of record: Maximum discharge, 2,590 cfs Apr. 12, 1965 (gage height, 15.29 ft); maximum gage height, 16.00 ft Apr. 3, 1966 (backwater from ice); no flow at times in most years.
Flood of April 1950 reached a stage of 15.25 ft, present datum, from floodmarks (discharge, 2,790 cfs).

REMARKS.--Records good except those for winter months, which are fair. Records of suspended sediment loads for the water year 1970 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.40	.40	.50	.60	.10		0	814	1,740	81	6.7	1.0
2	.20	.50	.50	.60	.10		0	660	1,220	58	5.8	1.0
3	.20	.50	.50	.60	.10		0	465	888	59	5.5	.90
4	.20	.50	.40	.60	.10		.10	348	643	52	4.9	.90
5	.30	.50	.40	.60	.10		.10	281	462	47	4.6	.90
6	.20	.40	.40	.60	.10		.20	220	343	42	4.1	.90
7	.10	.30	.40	.60	.10		.30	180	261	38	3.8	2.4
8	.30	.20	.40	.60	.10		.80	151	204	34	3.7	1.8
9	0	.20	.40	.60	.10		1.4	133	164	30	3.3	1.4
10	.30	.50	.40	.50	.10		2.0	116	136	27	3.2	1.2
11	.40	.40	.40	.50	0		3.0	118	145	24	3.1	1.0
12	.20	.50	.40	.50	0		4.5	139	364	23	2.8	1.0
13	.20	.50	.40	.40	0		6.0	170	1,190	22	2.7	.90
14	.10	.50	.40	.40	0		35	196	1,300	21	2.3	.80
15	.10	.50	.40	.40	0		120	204	868	21	2.6	.70
16	.10	.50	.40	.30	0		210	238	580	20	2.6	.70
17	.10	.50	.40	.30	0		300	369	571	18	2.2	.60
18	0	.50	.50	.30	0		430	523	1,460	18	2.6	.60
19	0	.40	.50	.30	0		720	498	1,950	18	2.0	.50
20	0	.40	.50	.20	0		770	355	1,450	16	1.9	.40
21	0	.40	.50	.20	0		730	250	1,340	14	1.9	.60
22	.20	.40	.50	.20	0		480	194	722	13	1.8	.50
23	.10	.40	.50	.20	0		423	194	508	12	1.6	.50
24	.10	.40	.60	.20	0		355	191	356	11	1.3	.40
25	.20	.40	.60	.20	0		416	181	257	10	1.3	.90
26	.30	.40	.60	.10	0		618	180	191	9.4	1.1	1.2
27	.10	.40	.60	.10	0		991	211	150	8.4	1.1	.70
28	.20	.40	.60	.10	0		975	247	127	7.8	1.0	.80
29	.20	.40	.60	.10	------		758	261	108	8.4	1.0	.50
30	.30	.40	.60	.10	------		729	461	95	7.6	1.5	.60
31	.30	------	.60	.10	------		------	1,690	------	7.8	1.3	------
TOTAL	5.40	12.70	14.90	11.10	1.00	0	9,078.40	10,238	19,793	788.4	85.3	26.20
MEAN	.17	.42	.48	.36	.036	0	303	330	660	25.4	2.75	.87
MAX	.40	.50	.60	.60	.10	0	991	1,690	1,950	81	6.7	2.4
MIN	0	.20	.40	.10	0	0	0	116	95	7.6	1.0	.40
AC-FT	11	25	30	22	2.0	0	18,010	20,310	39,260	1,560	169	52

CAL YR 1969 TOTAL 20,546.80 MEAN 56.3 MAX 2,300 MIN 0 AC-FT 40,750
WTR YR 1970 TOTAL 40,054.40 MEAN 110 MAX 1,950 MIN 0 AC-FT 79,450

05092000 Red River of the North at Drayton, N. Dak.

LOCATION.--Lat 48°34'20", long 97°08'50", in SE¼SE¼SE¼ sec.24, T.159 N., R.51 W., Pembina County, on downstream end of east pier of interstate highway bridge, 1.5 miles northeast of Drayton and at mile 206.7.

DRAINAGE AREA.--34,800 sq mi, approximately (includes 3,800 sq mi in closed basins).

PERIOD OF RECORD.--April 1936 to June 1937, April 1941 to current year (fragmentary prior to April 1949).

GAGE.--Water-stage recorder and concrete control. Datum of gage is 755.00 ft above mean sea level (Minnesota highway benchmark). Prior to Nov. 30, 1954, nonrecording gage at site 1.5 miles upstream at datum 1.59 ft higher.

AVERAGE DISCHARGE.--21 years (1949-70) 3,719 cfs (2,693,000 acre-ft per year); median of yearly mean discharges, 2,650 cfs (1,920,000 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 31,700 cfs Apr. 29 (gage height, 38.20 ft); minimum, 900 cfs Aug. 15 (gage height, 9.78 ft).
Period of record: Maximum discharge, 86,500 cfs May 12, 1950 (gage height, 41.58 ft, former site and datum); minimum observed, 7.7 cfs Oct. 16, 1936 (gage height, 1.75 ft, former site and datum).
Maximum discharge known since 1860, that of May 12, 1950. Flood of April 1897 reached a stage of about 41 ft, at site and datum in use prior to Nov. 30, 1954.

REMARKS.--Records good. Some regulation by reservoirs on tributaries. Records of water temperatures for the water year 1970 are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 1388: 1949-50. WSP 1728: Drainage area.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1,460	2,540	1,880	1,400	1,390	1,410	1,870	30,200	9,350	8,450	1,440	1,040
2	1,460	2,590	1,990	1,400	1,390	1,420	1,900	29,500	11,600	7,850	1,390	1,050
3	1,500	2,640	2,040	1,390	1,390	1,430	1,950	27,200	13,300	7,400	1,350	1,050
4	1,520	2,650	2,070	1,390	1,390	1,430	2,350	24,900	14,500	6,900	1,290	1,050
5	1,550	2,650	2,090	1,390	1,390	1,430	2,650	22,800	15,100	6,410	1,250	1,070
6	1,580	2,640	2,100	1,390	1,390	1,440	2,700	20,700	14,900	6,000	1,200	1,070
7	1,620	2,620	2,070	1,390	1,390	1,440	2,700	18,700	14,100	5,660	1,180	1,080
8	1,660	2,530	2,030	1,390	1,390	1,440	2,800	17,100	12,800	5,340	1,180	1,180
9	1,710	2,460	2,030	1,380	1,390	1,440	3,600	15,800	11,000	5,000	1,190	1,300
10	1,840	2,410	2,030	1,380	1,400	1,440	5,850	14,600	9,150	4,680	1,190	1,320
11	1,990	2,320	2,030	1,380	1,400	1,440	8,400	13,400	7,650	4,380	1,190	1,310
12	2,040	2,280	2,030	1,370	1,400	1,440	11,000	12,600	6,700	4,130	1,160	1,330
13	2,060	2,200	1,970	1,370	1,400	1,440	13,800	12,200	6,350	3,790	1,110	1,380
14	2,060	2,170	1,900	1,370	1,400	1,440	16,800	11,900	7,650	3,440	1,020	1,380
15	2,110	2,100	1,820	1,370	1,400	1,460	18,800	11,800	8,700	3,160	960	1,390
16	2,180	1,930	1,750	1,370	1,400	1,460	20,900	11,800	8,800	3,010	940	1,390
17	2,240	1,730	1,700	1,370	1,400	1,460	23,100	11,700	8,500	2,920	990	1,370
18	2,240	1,320	1,600	1,370	1,410	1,490	26,100	11,700	9,250	2,820	1,060	1,290
19	2,200	1,220	1,520	1,380	1,410	1,500	28,100	11,600	12,500	2,650	1,060	1,220
20	2,140	1,180	1,450	1,380	1,410	1,530	28,400	11,600	15,900	2,470	1,060	1,170
21	2,090	1,190	1,420	1,380	1,410	1,560	28,300	11,300	17,800	2,300	1,060	1,150
22	2,060	1,190	1,400	1,380	1,410	1,610	28,200	10,700	18,800	2,100	1,050	1,110
23	2,030	1,210	1,400	1,380	1,410	1,650	28,800	9,950	19,300	1,960	1,080	1,110
24	1,970	1,240	1,400	1,380	1,410	1,680	29,900	8,900	19,400	1,840	1,080	1,080
25	1,990	1,290	1,400	1,380	1,410	1,690	29,700	8,100	18,000	1,760	1,080	1,090
26	2,040	1,330	1,400	1,380	1,410	1,710	29,500	7,450	16,500	1,650	1,110	1,140
27	2,130	1,390	1,400	1,380	1,410	1,740	29,400	6,800	14,500	1,570	1,090	1,230
28	2,240	1,460	1,400	1,380	1,410	1,760	29,300	6,500	12,300	1,500	1,090	1,250
29	2,350	1,550	1,400	1,380	------	1,800	31,600	6,350	10,400	1,490	1,090	1,220
30	2,460	1,700	1,400	1,380	------	1,830	31,600	6,750	9,250	1,470	1,070	1,210
31	2,500	------	1,400	1,390	------	1,850	------	7,550	------	1,450	1,060	------
TOTAL	61,020	57,730	53,520	42,820	39,220	47,860	520,070	432,150	374,050	115,550	35,070	36,030
MEAN	1,968	1,924	1,726	1,381	1,401	1,544	17,340	13,940	12,470	3,727	1,131	1,201
MAX	2,500	2,650	2,100	1,400	1,410	1,850	31,600	30,200	19,400	8,450	1,440	1,390
MIN	1,460	1,180	1,400	1,370	1,390	1,410	1,870	6,350	6,350	1,450	940	1,040
AC-FT	121,000	114,500	106,200	84,930	77,790	94,930	1,032M	857,200	741,900	229,200	69,560	71,470

CAL YR 1969 TOTAL 2,093,110.00 MEAN 5,735 MAX 56,600 MIN 0 AC-FT 4,152,000
WTR YR 1970 TOTAL 1,815,090.00 MEAN 4,973 MAX 31,600 MIN 940 AC-FT 3,600,000

M Expressed in thousands.

05094000 South Branch Two Rivers at Lake Bronson, Minn.

LOCATION.--Lat 48°43'50", long 96°39'50", in SW¼SW¼ sec.30, T.161 N., R.46 W., Kittson County, on left bank 70 ft upstream from culvert on U.S. Highway 59 at town of Lake Bronson and 2 miles downstream from dam at outlet of Bronson Lake.

DRAINAGE AREA.--444 sq mi.

PERIOD OF RECORD.--September 1928 to November 1936, April to September 1937, April 1941 to October 1943, April to December 1944, April 1945 to September 1947, October 1953 to current year. Monthly discharge only for some periods, published in SWP 1308. Published as South Fork Two Rivers at Bronson prior to 1941.

GAGE.--Water-stage recorder. Datum of gage is 928.53 ft above mean sea level, datum of 1929 (Minnesota Highway Department bench mark). Prior to Nov. 23, 1953, nonrecording gage at bridge 100 ft downstream at datum 2.00 ft higher. Nov. 23, 1953, to Oct. 5, 1963, water-stage recorder at same site at datum 2.00 ft higher.

AVERAGE DISCHARGE.--29 years (1928-36, 1941-43, 1945-47, 1953-70), 95.8 cfs (69,400 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 4,140 cfs Apr. 14 (gage height, 14.51 ft); minimum daily, 1.4 cfs Feb. 3-15.
Period of record: Maximum discharge, 5,410 cfs Apr. 5, 1966 (gage height, 18.23 ft); no flow at times in 1937, 1941, 1960.

REMARKS.--Records good except those for winter months, which are fair. Flow partly regulated since 1937 by Bronson Lake (usable capacity, 3,700 acre-ft).

REVISIONS (WATER YEARS).--WSP 1308: 1929(M), 1931(M), 1936(M), 1944(M), 1947(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.2	2.2	2.2	2.3	1.5	2.5	3.3	2,340	3,970	311	18	2.8
2	5.0	2.5	2.1	2.3	1.5	2.6	3.3	1,940	3,510	303	19	2.3
3	4.7	2.8	2.1	2.3	1.4	2.8	3.4	1,600	2,620	283	18	2.3
4	4.2	2.5	2.0	2.3	1.4	2.9	3.5	1,210	2,040	245	17	2.3
5	4.4	2.8	2.0	2.3	1.4	3.0	5.0	907	1,450	243	17	2.0
6	4.5	2.8	2.1	2.3	1.4	3.1	7.2	684	1,040	217	15	2.5
7	4.8	2.5	2.1	2.3	1.4	3.1	26	603	665	173	13	4.8
8	4.2	2.2	2.1	2.3	1.4	3.1	27	560	608	176	46	3.4
9	4.3	2.5	2.1	2.3	1.4	3.0	27	660	563	178	49	2.4
10	4.9	2.8	2.1	2.3	1.4	3.0	25	1,380	600	175	42	3.2
11	4.0	2.5	2.1	2.2	1.4	2.9	12	1,600	1,500	123	3.7	8.6
12	3.8	2.8	2.0	2.2	1.4	2.8	6.0	1,590	1,440	74	2.8	11
13	3.8	2.5	2.0	2.2	1.4	2.8	30	1,500	1,310	128	2.8	12
14	3.7	2.5	2.0	2.1	1.4	2.7	130	1,450	1,210	201	2.9	12
15	4.5	2.5	2.0	2.1	1.4	2.7	220	1,790	1,120	253	2.9	13
16	5.4	2.5	2.0	2.0	1.5	2.7	321	2,030	987	111	2.8	11
17	5.9	2.5	2.0	2.0	1.7	2.7	517	2,000	1,100	6.6	2.7	10
18	4.9	2.4	1.9	1.9	1.8	2.8	736	1,900	1,530	84	2.6	9.1
19	4.2	2.3	1.9	1.9	1.8	2.9	1,050	1,670	1,770	158	2.5	8.9
20	3.4	2.3	1.9	1.8	1.9	3.1	1,250	1,340	2,070	106	2.7	8.3
21	2.6	2.3	2.0	1.8	2.0	3.3	1,270	953	1,910	70	2.8	7.8
22	2.0	2.3	2.0	1.7	2.0	3.4	1,330	715	1,720	48	3.2	6.5
23	2.0	2.3	2.0	1.7	2.1	3.5	1,350	655	1,430	52	3.2	6.3
24	2.0	2.3	2.1	1.7	2.1	3.6	1,430	623	1,040	55	3.4	5.8
25	2.2	2.4	2.1	1.6	2.1	3.6	1,560	556	659	57	3.1	6.5
26	2.5	2.4	2.1	1.6	2.2	3.5	1,800	733	523	56	3.2	6.5
27	2.2	2.4	2.2	1.6	2.2	3.5	1,980	880	566	54	3.0	6.0
28	2.5	2.3	2.2	1.5	2.3	3.4	2,280	818	462	52	64	6.2
29	2.5	2.3	2.2	1.5	------	3.4	2,550	1,330	363	49	6.5	6.2
30	2.5	2.2	2.2	1.5	------	3.3	2,590	2,370	296	8.1	4.1	6.7
31	2.2	------	2.3	1.5	------	3.3	------	3,100	------	13	2.7	------
TOTAL	115.0	73.6	64.1	61.1	46.9	95.0	22,542.7	41,477	40,072	4,062.7	381.6	196.4
MEAN	3.71	2.45	2.07	1.97	1.68	3.06	751	1,338	1,336	131	12.3	6.55
MAX	5.9	2.8	2.3	2.3	2.3	3.6	2,590	3,100	3,970	311	64	13
MIN	2.0	2.2	1.9	1.5	1.4	2.5	3.3	556	296	6.6	2.5	2.0
AC-FT	228	146	127	121	93	188	44,710	82,270	79,480	8,060	757	390

CAL YR 1969 TOTAL 48,460.1 MEAN 133 MAX 3,480 MIN 1.9 ACFT 96,120
WAT YR 1970 TOTAL 109,188.1 MEAN 299 MAX 3,970 MIN 1.4 ACFT 216,600

05102500 Red River of the North at Emerson, Manitoba

(International gaging station)

LOCATION.--Lat 49°00'30", long 97°12'40", in sec.2, T.1, R.2 E., on right bank 1,500 ft downstream from Canadian National Railway bridge in Emerson, 0.8 mile downstream from international boundary, 3.6 miles downstream from Pembina River, and at mile 154.3.

DRAINAGE AREA.--40,200 sq mi, approximately (includes 3,800 sq mi in closed basins).

PERIOD OF RECORD.--March to November 1902 (gage heights only), May 1912 to September 1929 (monthly discharge only, published in WSP 1308), October 1929 to current year.

GAGE.--Water-stage recorder. Datum of gage is 700.00 ft above mean sea level, datum of 1929, by Geodetic Survey of Canada. See WSP 1728 or 1913 for history of changes prior to Apr. 10, 1953.

AVERAGE DISCHARGE.--58 years (1912-70) 3,100 cfs (2,246,000 acre-ft per year); median of yearly mean discharges, 2,580 cfs (1,870,000 acre-ft per year).

EXTREMES.--Current year: Maximum daily discharge, 39,600 cfs April 29; maximum gage height, 84.72 ft May 1; minimum daily discharge 1,120 cfs Nov. 24, 25; minimum daily gage height, 48.01 ft Sept. 4.
Period of record: Maximum discharge, 95,500 cfs May 13, 1950 (gage height, 90.89 ft); minimum observed 0.9 cfs Feb. 6-8, 1937 (gage height, 44.00 ft).

REMARKS.--Records good. Discharge partially regulated by reservoirs on tributaries.

COOPERATION.--This station is one of the international gaging stations maintained by Canada under agreement with the United States.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1,630	2,600	1,750	1,390	1,410	1,450	1,830	39,300	12,600	13,100	2,380	1,330
2	1,630	2,660	1,860	1,420	1,420	1,460	1,880	38,700	14,300	11,600	2,280	1,310
3	1,660	2,700	1,890	1,440	1,420	1,480	1,950	37,300	16,100	10,400	2,180	1,280
4	1,700	2,750	1,860	1,460	1,430	1,500	2,050	37,500	17,500	9,380	2,090	1,270
5	1,710	2,720	1,830	1,470	1,440	1,510	2,170	35,900	18,300	8,570	2,000	1,310
6	1,730	2,700	1,810	1,490	1,450	1,530	2,270	34,000	18,700	7,880	1,910	1,360
7	1,740	2,690	1,800	1,500	1,450	1,530	2,350	31,700	18,500	7,360	1,840	1,340
8	1,780	2,660	1,760	1,500	1,430	1,540	2,400	29,800	17,900	6,950	1,780	1,340
9	1,820	2,600	1,740	1,490	1,390	1,540	2,530	28,300	16,700	6,560	1,710	1,370
10	1,880	2,540	1,730	1,480	1,370	1,540	3,380	26,900	15,400	6,250	1,730	1,450
11	1,980	2,470	1,740	1,460	1,370	1,540	5,920	25,300	14,500	5,970	1,730	1,520
12	2,090	2,420	1,750	1,440	1,370	1,540	9,410	23,800	14,300	5,790	1,720	1,520
13	2,150	2,250	1,740	1,420	1,370	1,540	12,500	22,600	14,500	5,620	1,690	1,530
14	2,180	2,110	1,700	1,410	1,380	1,530	14,900	21,500	14,800	5,340	1,610	1,550
15	2,200	2,060	1,640	1,440	1,370	1,540	16,700	20,900	14,800	5,050	1,510	1,570
16	2,230	2,070	1,580	1,480	1,380	1,540	19,000	20,900	14,500	4,920	1,420	1,580
17	2,290	1,990	1,530	1,480	1,390	1,550	20,900	20,600	14,000	4,890	1,350	1,580
18	2,350	2,150	1,480	1,500	1,400	1,570	23,000	20,300	13,500	4,750	1,360	1,560
19	2,370	2,030	1,440	1,500	1,410	1,580	26,500	20,000	14,200	4,500	1,380	1,520
20	2,350	1,960	1,390	1,450	1,410	1,590	30,100	19,500	16,300	4,220	1,380	1,470
21	2,300	1,710	1,340	1,440	1,400	1,590	33,800	19,000	18,700	3,970	1,390	1,370
22	2,260	1,440	1,320	1,490	1,390	1,590	37,300	18,200	21,000	3,690	1,390	1,310
23	2,220	1,220	1,300	1,480	1,410	1,600	35,200	17,100	22,000	3,380	1,370	1,320
24	2,180	1,120	1,330	1,480	1,430	1,610	36,200	15,800	22,200	3,120	1,370	1,300
25	2,140	1,120	1,360	1,450	1,440	1,630	36,800	14,600	22,100	2,900	1,370	1,280
26	2,150	1,140	1,370	1,440	1,450	1,650	37,300	13,500	21,400	2,750	1,360	1,280
27	2,180	1,190	1,350	1,430	1,460	1,680	38,600	12,600	20,100	2,610	1,360	1,280
28	2,260	1,250	1,330	1,410	1,460	1,700	39,500	11,800	18,400	2,480	1,350	1,330
29	2,370	1,390	1,330	1,410	------	1,730	39,600	11,400	16,500	2,370	1,340	1,380
30	2,490	1,580	1,330	1,410	------	1,760	39,500	11,300	14,700	2,290	1,350	1,400
31	2,570	------	1,310	1,410	------	1,790	------	11,600	------	2,310	1,340	------
TOTAL	64,590	61,290	48,690	45,070	39,500	48,930	575,540	711,700	508,500	170,970	50,040	42,010
MEAN	2,084	2,043	1,571	1,454	1,411	1,578	19,180	22,960	16,950	5,515	1,614	1,400
MAX	2,570	2,750	1,890	1,500	1,460	1,790	39,600	39,300	22,200	13,100	2,380	1,580
MIN	1,630	1,120	1,300	1,390	1,370	1,450	1,830	11,300	12,600	2,290	1,340	1,270
AC-FT	128,100	121,600	96,580	89,400	78,350	97,050	1,142M	1,412M	1,009M	339,100	99,250	83,330

CAL YR 1969 TOTAL 2,496,470 MEAN 6,840 MAX 54,700 MIN 1,120 AC-FT 4,952,000
WTR YR 1970 TOTAL 2,366,830 MEAN 6,484 MAX 39,600 MIN 1,120 AC-FT 4,695,000

M Expressed in thousands.

05104500 Roseau River below South Fork near Malung, Minn.

LOCATION.--Lat 48°47'30", long 95°44'40", in SW¼ sec.6, T.161 N., R.39 W., Roseau County, on left bank 0.3 mile downstream from South Fork and 1.5 miles northwest of Malung.

DRAINAGE AREA.--573 sq mi.

PERIOD OF RECORD.--October 1946 to current year.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 1,029.67 ft above mean sea level, adjustment of 1912.

AVERAGE DISCHARGE.--24 years, 159 cfs (115,200 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 3,010 cfs Apr. 29 (gage height, 16.74 ft); minimum daily, 0.9 cfs Aug. 24; minimum gage height, 4.43 ft Aug. 29.

Period of record: Maximum discharge, 5,750 cfs (revised) July 18, 1968 (gage height, 22.32 ft); maximum gage height, 23.37 ft Apr. 3, 1966, backwater from ice; no flow for part of Jan. 15, 1952 (caused by construction of concrete control) and July 23 to Sept. 8, 1961.

REVISIONS.--The figures of maximum discharge for some water years have been revised, as shown in the following table. They supersede figures published in the water-supply papers indicated.

WSP	Water year	Date	Discharge (cfs)	Gage height (feet)	WSP	Water year	Date	Discharge (cfs)	Gage height (feet)
1115, 1308, 1678	1948	Apr. 21, 1948	3,940	18.39	1913, WRD Minn.	1962	June 12, 1962	3,330	16.98
1137B, 1175, 1308, 1678	1950	Apr. 24, 1950	4,750	a 22.51	WRD Minn.	1966	Apr. 3, 1966	5,050	23.37
1208, 1728	1951	Apr. 9, 1951	3,240	16.76	WRD Minn.	1967	Mar. 31, 1967	3,410	18.67
1438, 1728	1956	Apr. 24, 1956	2,410	14.68	WRD Minn.	1968	July 18, 1968	5,750	22.32
1508, 1728	1957	Sept. 6, 1957	2,590	15.13					

a Backwater from ice

REMARKS.--Records good except those for winter months, which are fair. Some flow bypasses the gaging station through overflow channel 0.8 mile upstream and returns to river 0.5 mile downstream. Overflow begins at stage of about 13.0 ft, discharge, 1,800 cfs. Records prior to 1969 water year do not include this overflow. Revisions for high water periods which include this channel are given below.

REVISIONS (WATER YEARS).--Revised figures of discharge, in cubic feet per second, for high-water periods in water years 1948, 1950, 1951, and 1968, superseding figures published in WSP 1115, 1137B, 1175, 1208, 1308, 1728, and WRD Minn. 1968 are given below:

Apr. 17, 1948.	2,380	Apr. 27, 1950.	2,800	May 11, 1950.	3,340	June 9, 1968.	4,250
18.....	3,340	28.....	2,600	12.....	3,040	10.....	4,430
19.....	3,710	29.....	2,380	13.....	2,560	11.....	4,500
20.....	3,780	30.....	2,350	14.....	2,070	12.....	4,070
21.....	3,890	May 1, 1950.	2,400	Apr. 8, 1951.	2,920	13.....	3,260
22.....	3,480	2.....	2,290	9.....	3,100	14.....	2,430
23.....	2,900	3.....	2,310	10.....	3,030	July 17, 1968.	3,480
24.....	2,360	4.....	2,400	11.....	3,110	18.....	5,670
25.....	1,930	5.....	2,760	12.....	2,830	19.....	5,360
Apr. 22, 1950.	2,800	6.....	3,570	13.....	2,430	20.....	4,270
23.....	4,210	7.....	3,990	14.....	2,210	21.....	3,140
24.....	4,700	8.....	3,760	15.....	2,060	Aug. 26, 1968.	1,940
25.....	4,360	9.....	3,440	16.....	1,880	27.....	2,440
26.....	3,500	10.....	3,380	June 8, 1968.	1,700	28.....	1,970

Month	Cfs-days	Maximum	Minimum	Mean	Acre-feet
April 1948	38,648	3,890	15	1,289	76,660
Water year 1948	59,530.8	3,890	1.3	163	118,100
Calendar year 1948	57,305.4	3,890	0.8	157	113,700
April 1950	31,795.5	4,700	6.0	1,060	63,070
May 1950	58,644	3,990	408	1,892	116,300
Water year 1950	125,854.4	4,700	0.8	345	249,600
Calendar year 1950	133,965.0	4,700	2.2	367	265,700
April 1951	47,429	3,110	14	1,581	94,080
Water year 1951	74,320.1	3,110	3.0	204	147,400
Calendar year 1951	67,352.7	3,110	3.0	185	133,600
June 1968	34,197	4,500	59	1,140	67,830
July 1968	35,706	5,670	156	1,152	70,820
August 1968	18,143	2,440	107	585	35,990
Water year 1968	107,769.1	5,670	0.4	294	213,800
Calendar year 1968	117,325.1	5,670	0.6	321	232,700

05104500 Roseau River below South Fork near Malung, Minn.--Continued

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4.9	38	7.8	8.6	6.2	5.6	7.8	1,980	1,250	207	14	38
2	6.8	52	7.8	8.6	6.2	5.8	7.7	1,490	1,110	179	14	26
3	7.3	74	7.8	8.6	6.0	6.2	7.7	1,220	980	157	11	18
4	9.0	56	7.7	8.6	5.8	6.4	7.8	1,000	814	138	9.3	14
5	11	45	7.7	8.5	5.8	6.4	8.0	846	656	122	8.0	12
6	11	39	7.7	8.3	5.8	6.4	8.3	740	528	109	6.8	9.7
7	12	36	7.7	8.0	5.8	6.2	9.0	658	425	96	6.0	52
8	12	33	7.7	7.6	5.8	6.2	10	592	336	84	5.3	298
9	11	34	7.8	7.6	5.6	6.2	12	710	274	74	4.7	226
10	16	34	7.8	7.3	5.6	6.2	15	718	252	65	4.3	120
11	26	33	7.8	7.3	5.6	6.2	35	870	252	58	3.7	94
12	29	32	7.7	7.1	5.6	6.1	100	1,040	422	55	4.5	82
13	41	30	7.7	6.8	5.6	6.0	400	1,110	552	54	2.9	72
14	55	21	7.8	6.6	5.6	6.0	820	1,080	638	67	3.0	54
15	58	17	7.9	6.8	5.6	6.0	1,100	1,200	686	75	3.1	45
16	69	16	7.9	6.8	5.6	6.1	1,300	1,280	915	77	2.7	42
17	67	14	8.0	6.4	5.6	6.1	1,400	1,210	1,700	77	2.1	40
18	69	13	8.1	6.2	5.6	6.2	1,250	1,120	2,350	49	2.0	38
19	67	12	8.1	6.2	5.8	6.4	1,000	980	2,500	53	1.6	35
20	66	11	8.2	6.2	5.8	6.6	882	830	2,200	63	1.4	33
21	66	10	8.3	6.0	5.8	6.9	602	712	1,800	49	1.3	27
22	59	9.8	8.4	6.0	5.8	7.2	490	648	1,520	44	1.4	23
23	44	9.6	8.5	6.0	5.8	7.5	694	614	1,130	38	1.1	20
24	44	9.2	8.5	5.8	5.8	8.0	1,290	562	828	33	.90	20
25	41	8.8	8.6	5.8	5.8	8.4	1,680	552	630	32	2.0	21
26	39	8.6	8.6	6.0	5.8	8.2	1,690	746	501	27	1.8	19
27	39	8.3	8.6	6.0	5.8	8.1	1,460	902	391	23	1.6	18
28	40	8.2	8.6	6.0	5.6	8.0	2,210	938	332	20	1.5	23
29	43	8.0	8.7	6.0	------	8.0	2,880	1,610	286	24	1.5	17
30	43	8.0	8.7	6.0	------	7.9	2,670	1,540	241	21	13	13
31	40	------	8.7	6.2	------	7.8	------	1,350	------	17	34	------
TOTAL	1,146.0	728.5	250.9	213.9	161.2	209.3	24,046.3	30,848	26,499	2,187	170.50	1,549.7
MEAN	37.0	24.3	8.09	6.90	5.76	6.75	802	995	883	70.5	5.50	51.7
MAX	69	74	8.7	8.6	6.2	8.4	2,880	1,980	2,500	207	34	298
MIN	4.9	8.0	7.7	5.8	5.6	5.6	7.7	552	241	17	.90	9.7
AC-FT	2,270	1,440	498	424	320	415	47,700	61,190	52,560	4,340	338	3,070

CAL YR 1969 TOTAL 63,896 MEAN 175 MAX 4,850 MIN 3.5 AC-FT 126,700
WTR YR 1970 TOTAL 88,010.30 MEAN 241 MAX 2,880 MIN .90 AC-FT 174,600

05106000 Sprague Creek near Sprague, Manitoba

(International gaging station)

LOCATION.--Lat 48°59'33", long 95°39'43", in NE¼ sec.34, T.164 N., R.39 W., Roseau County, on left bank 0.5 mile south of international boundary, 3.5 miles south of Sprague, Manitoba, 8 miles upstream from mouth, and 10.5 miles northeast of Roseau, Minn.

DRAINAGE AREA.--169 sq mi. Prior to October 1958, 151 sq mi; change due to construction of drainage ditch within basin.

PERIOD OF RECORD.--September 1928 to current year (winter records incomplete prior to 1941). Prior to September 1951, published as Mud Creek near Sprague.

GAGE.--Water-stage recorder and concrete control. Datum of gage is 1,038.4 ft above mean sea level, adjustment of 1928 by Geodetic Survey of Canada. Prior to Mar. 15, 1929, nonrecording gage at same site and datum.

AVERAGE DISCHARGE.--31 years (1928-29, 1940-70), 62.9 cfs (45,570 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 1,180 cfs Apr. 28 (gage height, 12.76 ft); minimum daily, 1.3 cfs Sept. 6.
Period of record: Maximum discharge, 2,070 cfs Sept. 1, 1942 (gage height, 15.31 ft), from rating curve extended above 960 cfs; no flow at times in some years.

REMARKS.--Records good except those for winter months, which are fair.

COOPERATION.--This station is maintained by the United States under agreement with Canada.

REVISIONS (WATER YEARS).--WSP 1055: 1944. WSP 1308: 1931(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	9.3	25	5.2	1.9	1.6	1.8	1.7	865	889	61	38	2.3
2	9.8	27	5.4	1.9	1.6	1.9	1.7	802	749	58	27	1.9
3	11	25	4.8	1.8	1.6	2.0	1.7	695	622	45	19	2.2
4	15	24	3.7	1.8	1.6	2.1	1.7	597	509	41	14	1.9
5	25	23	3.2	1.8	1.6	2.2	1.7	523	418	35	13	1.8
6	25	21	4.4	1.7	1.6	2.2	1.7	463	345	33	10	1.3
7	24	20	4.9	1.7	1.6	2.2	3.0	405	287	29	8.8	2.5
8	25	20	4.9	1.7	1.6	2.3	7.0	359	242	24	7.3	14
9	26	20	4.8	1.7	1.6	2.3	13	387	199	19	6.5	17
10	41	20	4.8	1.7	1.6	2.4	28	423	191	18	5.4	16
11	61	20	4.7	1.7	1.6	2.4	50	446	167	15	4.6	15
12	58	20	4.5	1.7	1.6	2.3	90	498	146	16	4.0	15
13	54	18	4.3	1.6	1.5	2.3	125	490	131	22	3.6	15
14	51	16	4.1	1.6	1.5	2.3	168	465	112	24	3.1	14
15	48	16	3.8	1.6	1.5	2.2	200	530	103	18	3.0	13
16	47	14	3.6	1.6	1.5	2.1	320	621	226	16	2.5	17
17	46	13	3.4	1.6	1.5	2.0	390	603	570	12	2.7	17
18	44	11	3.2	1.6	1.5	2.0	335	555	481	10	2.7	16
19	42	10	3.0	1.6	1.5	1.9	280	466	354	10	2.5	15
20	38	10	2.8	1.6	1.5	1.8	200	394	264	9.1	2.5	12
21	36	8.6	2.7	1.6	1.5	1.8	175	372	207	7.9	2.1	11
22	35	6.8	2.5	1.6	1.5	1.8	155	351	162	6.5	2.2	12
23	31	6.4	2.4	1.6	1.5	1.8	280	319	128	5.7	2.5	11
24	29	6.0	2.3	1.7	1.6	1.8	425	289	103	5.2	2.0	10
25	32	5.8	2.2	1.7	1.6	1.8	618	314	90	4.3	1.8	8.6
26	32	5.6	2.1	1.7	1.6	1.8	718	347	89	3.8	1.5	8.0
27	33	5.4	2.1	1.7	1.7	1.9	884	328	81	3.4	1.6	7.7
28	26	5.1	2.0	1.7	1.7	2.0	1,150	314	74	3.0	1.4	7.2
29	32	4.6	2.0	1.7	------	2.0	1,080	833	69	56	1.4	7.2
30	23	4.8	1.9	1.7	------	1.9	973	894	69	67	1.8	5.9
31	23	------	1.9	1.7	------	1.7	------	969	------	51	2.4	------
TOTAL	1,032.1	432.1	107.6	52.3	43.9	63.0	8,677.2	15,917	8,077	728.9	200.9	298.5
MEAN	33.3	14.4	3.47	1.69	1.57	2.03	289	513	269	23.5	6.48	9.95
MAX	61	27	5.4	1.9	1.7	2.4	1,150	969	889	67	38	17
MIN	9.3	4.6	1.9	1.6	1.5	1.7	1.7	289	69	3.0	1.4	1.3
AC-FT	2,050	857	213	104	87	125	17,210	31,570	16,020	1,450	398	592

CAL YR 1969 TOTAL 26,085.4 MEAN 71.5 MAX 857 MIN 1.0 AC-FT 51,740
WTR YR 1970 TOTAL 35,630.5 MEAN 97.6 MAX 1,150 MIN 1.3 AC-FT 70,670

05106500 Roseau River at Roseau Lake, Minn.

LOCATION (REVISED).--Lat 48°54'22", long 95°49'55", in SW¼SW¼ sec.28, T.163 N., R.40 W., Roseau County on downstream side of bridge near left bank at Roseau Lake, 3.5 miles upstream from Pine Creek, 3.8 miles downstream from Sprague Creek, and 7 miles northwest of Roseau.

PERIOD OF RECORD.--November 1939 to current year (incomplete).

GAGE.--Water-stage recorder. Datum of gage is 1,018.59 ft above mean sea level, adjustment of 1928 by Geodetic Survey of Canada. Prior to Aug. 26, 1970, nonrecording gage at same site and datum. Gage readings have been reduced to elevations above mean sea level.

EXTREMES.--Current year: Maximum elevation observed, 1,035.30 ft May 3; minimum recorded, 1,020.77 ft Aug. 26.
Period of record: Maximum elevation observed, 1,036.86 ft May 13, 1950; minimum observed, 1,019.75 ft Aug. 16, 1941.
Flood of July 1919 reached an elevation of about 1,034 ft.

GAGE HEIGHT, IN FEET, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1								35.05	34.42	31.59	22.26	21.49
2			21.53					35.15	34.47	31.24		21.68
3								35.30	34.47	30.86		21.54
4									34.42	30.51		21.38
5								35.15	34.32	30.14		21.24
6								35.05	34.07	29.86	21.41	21.19
7								34.90	33.99	29.39		21.27
8								34.85				23.14
9								34.73	33.42	28.46	21.36	24.53
10								34.60	33.19	27.96		23.97
11								35.51		27.36		23.10
12							26.69	34.47		26.36		22.67
13							28.54	34.43	32.59			22.46
14							29.64	34.43	32.37			22.31
15							30.49	34.47	32.19			22.14
16							31.17	34.51	32.24		20.96	22.09
17							31.59	34.52				22.05
18							32.09	34.52	32.59	23.91		22.00
19								34.47	33.14	23.56		21.94
20							32.69	34.37	33.38			21.86
21							32.59	34.25	33.51	23.09		21.81
22							32.41	34.15		23.21		21.72
23							32.31	34.02			20.86	21.64
24	22.72						32.54	33.82	33.30			21.58
25							32.94	33.72	33.12	22.41		21.56
26							33.38	33.57	32.99		20.79	21.56
27							33.64	33.52	32.77		20.83	21.54
28								33.42	32.44		20.82	21.52
29					------		34.37	33.82		22.36	20.81	21.58
30					------		34.65	33.97	31.86		20.90	21.52
31		------			------		------	34.22	------		21.09	------

NOTE.--Add 1,000.00 ft to obtain elevation above mean sea level.

05107500 Roseau River at Ross, Minn.

LOCATION.--Lat 48°54'37", long 95°55'18", in SE¼ sec.27, T.163 N., R.41 W., Roseau County, on left bank 300 ft downstream from highway bridge, 0.2 mile north of Ross, and 2.3 miles downstream from Pine Creek.

DRAINAGE AREA.--1,220 sq mi, approximately.

PERIOD OF RECORD.--July 1928 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,018.44 ft above mean sea level, adjustment of 1928 by Geodetic Survey of Canada. Prior to Mar. 13, 1929, nonrecording gage at same site and datum.

AVERAGE DISCHARGE.--42 years, 270 cfs (195,600 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 3,440 cfs May 4 (gage height, 15.99 ft); minimum, 6.2 cfs Aug. 26 (gage height, 1.15 ft).
Period of record: Maximum discharge, 6,560 cfs May 12, 1950 (gage height, 18.25 ft); no flow Aug. 29, 30, 1961.
Maximum stage known, about 19 ft in 1896. Other outstanding floods reached the following stages (from information by local residents): flood of July 1919, 17.5 ft; flood of 1927, about 16 ft.

REMARKS.--Records good except those for winter months, which are fair. High flow regulated by natural storage in Roseau Lake.

REVISIONS (WATER YEARS).--WSP 1055: 1945. WSP 1175: Drainage area. WSP 1308: 1936(M). WSP 1508: 1948-49(P).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	26	103	24	23	11	9.0	17	3,150	2,720	1,730	100	33
2	34	105	25	23	11	9.0	16	3,300	2,750	1,640	83	47
3	36	109	25	23	11	9.5	16	3,360	2,750	1,550	71	42
4	45	117	26	23	11	9.5	16	3,390	2,720	1,470	62	32
5	60	111	27	23	10	9.5	17	3,360	2,690	1,370	52	25
6	72	104	27	23	10	10	17	3,250	2,610	1,280	44	23
7	79	96	28	23	10	10	18	3,140	2,550	1,190	42	24
8	86	93	28	23	10	10	21	3,110	2,450	1,100	33	147
9	87	91	28	22	10	10	24	3,100	2,370	998	25	329
10	99	92	27	22	10	10	30	2,990	2,300	891	20	279
11	143	93	27	21	10	10	50	2,900	2,230	770	18	186
12	164	95	26	21	10	11	130	2,820	2,150	681	16	139
13	154	89	26	20	10	11	450	2,780	2,050	629	14	120
14	147	79	25	19	10	12	730	2,740	1,970	515	12	107
15	144	65	25	19	10	12	780	2,760	1,910	431	11	94
16	141	55	25	18	10	13	840	2,760	1,880	359	11	89
17	141	47	25	17	10	13	900	2,760	1,930	303	9.3	87
18	138	42	25	17	9.5	14	1,150	2,760	2,030	257	9.7	84
19	133	37	24	16	9.5	14	1,550	2,750	2,130	219	9.3	80
20	124	34	24	15	9.5	14	1,720	2,740	2,220	193	9.3	74
21	117	31	24	14	9.5	14	1,900	2,690	2,280	172	8.9	69
22	116	29	24	13	9.0	14	1,920	2,630	2,320	129	8.5	64
23	117	28	24	13	9.0	14	1,920	2,580	2,290	95	8.9	57
24	112	28	24	12	9.0	14	2,000	2,510	2,280	80	8.5	51
25	108	29	24	12	9.0	15	2,100	2,410	2,230	72	7.7	49
26	107	30	24	12	9.0	15	2,230	2,390	2,160	66	7.0	48
27	101	29	23	12	9.0	15	2,390	2,390	2,080	60	7.0	46
28	98	27	23	11	9.0	16	2,600	2,380	1,980	52	7.4	44
29	98	25	23	11	------	17	2,730	2,450	1,890	69	7.7	47
30	100	24	23	11	------	17	2,880	2,560	1,820	131	9.7	45
31	100	------	23	11	------	17	------	2,670	------	123	14	------
TOTAL	3,227	1,937	776	543	275.0	388.5	31,162	87,580	67,740	18,625	746.9	2,561
MEAN	104	64.6	25.0	17.5	9.82	12.5	1,039	2,825	2,258	601	24.1	85.4
MAX	164	117	28	23	11	17	2,880	3,390	2,750	1,730	100	329
MIN	26	24	23	11	9.0	9.0	16	2,380	1,820	52	7.0	23
AC-FT	6,400	3,840	1,540	1,080	545	771	61,810	173,700	134,400	36,940	1,480	5,080

CAL YR 1969 TOTAL 133,559 MEAN 366 MAX 3,470 MIN 17 AC-FT 264,900
WTR YR 1970 TOTAL 215,561.4 MEAN 591 MAX 3,390 MIN 7.0 AC-FT 427,600

05112000 Roseau River below State ditch 51, near Caribou, Minn.

(International gaging station)

LOCATION.--Lat 48°58'54", long 96°27'46", in SE¼SW¼ sec. 34, T.164 N., R.45 W., Kittson County, on left bank 400 ft downstream from State ditch 51 (known locally as Caribou cutoff ditch) and 0.6 mile west of Caribou.

DRAINAGE AREA.--1,570 sq mi, approximately.

PERIOD OF RECORD.--April to October 1917, April 1920 to current year (some winter records incomplete). Published as "at Caribou", prior to April 1929; as "below Cutoff ditch, near Caribou" April 1929 to September 1936. Records published for both sites April 1929 to September 1930. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 1,002.14 ft above mean sea level, adjustment of 1928, by Geodetic Survey of Canada. Prior to Apr. 1, 1929, nonrecording gage at site at Caribou 0.6 mile upstream at datum 0.95 ft lower.

AVERAGE DISCHARGE.--15 years (1920-30, 1932-33, 1936-37, 1940-43), 298 cfs (215,700 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 2,940 cfs May 15 (gage height, 10.05 ft); minimum daily recorded, 19 cfs Aug. 24, 25, 26.
Period of record: Maximum discharge, 4,080 cfs May 19, 1950 (gage height, 11.81 ft); no flow Aug. 13, 1936. Flood of 1916 is reported to have reached a stage of about 15.5 ft at former site.

REMARKS.--Records good except those for periods of ice effect or no gage-height record, which are fair. Occasionally, at high stages, there is some natural diversion of flow above station to headwaters of Two Rivers. Station is not operated during winter period.

COOPERATION.--This station is maintained by the United States under agreement with Canada.

REMARKS.--Records good. Occasionally, at high stages, there is some natural diversion of flow above station to headwaters of Two Rivers. Station is not operated during winter period.

COOPERATION.--This station is maintained by the United States under agreement with Canada.

REVISIONS (WATER YEARS).--WSP 1308: 1938(M). WSP 1508: 1917(M), 1920, 1932(M), 1934-35(M). WSP 1913: 1954(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	67	136	52				27	2,510	2,860	2,290	165	36
2	67	140	51				27	2,560	2,810	2,250	134	45
3	73	138	50				27	2,600	2,780	2,220	105	66
4	80	134	49				28	2,620	2,750	2,180	83	68
5	88	130					28	2,680	2,730	2,160	71	63
6	102	129					29	2,710	2,710	2,130	63	54
7	116	126					30	2,730	2,690	2,090	56	63
8	129	124					34	2,750	2,680	2,030	51	80
9	134	120					36	2,840	2,670	1,980	46	167
10	145	118					42	2,880	2,670	1,920	43	342
11	169	115					60	2,900	2,750	1,860	38	342
12	218	113					100	2,910	2,770	1,800	34	254
13	239	104					160	2,890	2,750	1,750	33	184
14	222	68					350	2,880	2,690	1,670	29	152
15	214	94					600	2,930	2,660	1,560	28	136
16	202	90					780	2,910	2,640	1,430	25	118
17	194	80					830	2,850	2,650	1,240	24	105
18	190	76					870	2,800	2,600	1,010	26	102
19	186	74					920	2,750	2,550	846	26	94
20	179	71					1,000	2,740	2,520	656	24	91
21	177	69					1,100	2,750	2,470	507	22	83
22	160	68					1,220	2,740	2,430	403	22	75
23	152	67					1,430	2,720	2,400	315	22	75
24	152	66					1,890	2,690	2,360	222	19	67
25	149	64					2,030	2,720	2,350	177	19	67
26	143	61					2,150	2,700	2,370	145	21	64
27	152	59					2,240	2,690	2,360	120	23	59
28	162	57					2,350	2,700	2,350	104	26	58
29	131	55			------		2,440	2,880	2,320	92	28	56
30	125	53			------		2,480	2,900	2,310	97	38	57
31	129	------			------		------	2,870	------	158	38	------
TOTAL	4,646	2,799					25,308	85,800	77,650	37,412	1,382	3,223
MEAN	150	93.3					844	2,768	2,588	1,207	44.6	107
MAX	239	140					2,480	2,930	2,860	2,290	165	342
MIN	67	53					27	2,510	2,310	92	19	36
AC-FT	9,220	5,550					50,200	170,200	154,000	74,210	2,740	6,390

05124480 Kawishiwi River near Ely, Minn.

(Hydrologic bench-mark station)

LOCATION.--Lat 47°55'22", long 91°32'06", in SE¼ sec.24, T.63 N., R.10 W., Lake County, on left bank upstream from rapids, 2 miles upstream from South Kawishiwi River, 2.2 miles southwest of Fernberg Lookout Tower and 14 miles east of Ely.

DRAINAGE AREA.--253 sq mi.

PERIOD OF RECORD.--June 1966 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,450 ft (from topographic map).

EXTREMES.--Current year: Maximum discharge, 1,470 cfs June 13 (gage height, 5.83 ft); minimum, 41 cfs Aug. 27; minimum gage height, 2.90 ft Sept. 30.
Period of record: Maximum discharge, 1,540 cfs Apr. 29, 1969 (gage height, 5.88 ft); minimum, 24 cfs Sept. 28, 29, 1966; minimum gage height, 2.70 ft Feb. 23-29, 1968.

REMARKS.--Records good. Records of chemical analyses and water temperatures for the water year 1970 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	122	135	186	143	94	65	56	600	1,300	565	115	46
2	122	143	186	139	91	65	54	710	1,270	525	110	46
3	122	144	184	137	90	68	54	850	1,250	491	103	46
4	122	146	176	135	88	72	54	1,000	1,210	459	100	48
5	122	150	176	134	86	69	54	1,070	1,160	433	96	48
6	122	154	176	130	86	68	54	1,100	1,120	407	92	50
7	122	161	179	128	85	68	54	1,130	1,080	412	91	51
8	122	163	179	127	84	68	55	1,140	1,020	422	88	51
9	122	165	179	127	82	66	56	1,160	981	397	84	51
10	122	165	179	122	82	65	57	1,160	1,330	373	82	52
11	122	167	179	122	82	64	58	1,160	1,410	344	79	52
12	123	169	179	122	81	63	60	1,150	1,440	322	77	52
13	123	172	179	120	79	62	65	1,110	1,460	308	73	53
14	123	174	179	116	78	62	72	1,070	1,410	287	70	53
15	122	176	174	115	77	62	82	1,040	1,320	275	72	53
16	122	176	172	115	76	62	100	1,020	1,260	258	70	54
17	120	179	172	115	76	62	110	981	1,180	236	68	54
18	118	186	167	111	76	60	120	939	1,120	222	65	54
19	118	192	165	108	73	59	130	897	1,060	213	62	56
20	116	192	163	107	72	58	140	943	1,010	206	58	57
21	115	192	161	105	72	57	150	1,230	960	197	54	57
22	115	194	158	103	70	57	170	1,200	918	186	53	57
23	113	194	158	103	70	57	195	1,220	869	176	52	57
24	111	194	154	103	69	57	225	1,240	829	169	50	57
25	113	194	154	103	68	57	255	1,260	782	161	44	56
26	122	189	154	103	68	57	280	1,270	735	154	44	54
27	122	189	154	99	66	57	310	1,280	702	150	42	53
28	122	189	150	97	66	56	350	1,290	670	144	44	52
29	122	186	148	97	------	56	420	1,300	633	137	45	51
30	122	189	146	96	------	56	500	1,300	596	132	45	50
31	125	------	144	96	------	56	------	1,300	------	125	46	------
TOTAL	3,729	5,219	5,210	3,578	2,187	1,911	4,340	34,120	32,085	8,886	2,174	1,571
MEAN	120	174	168	115	78.1	61.6	145	1,101	1,070	287	70.1	52.4
MAX	125	194	186	143	94	72	500	1,300	1,460	565	115	57
MIN	111	135	144	96	66	56	54	600	596	125	42	46
CFSM	.47	.69	.66	.45	.31	.24	.57	4.35	4.23	1.13	.28	.21
IN.	.55	.77	.77	.53	.32	.28	.64	5.02	4.72	1.31	.32	.23

CAL YR 1969 TOTAL 93,387 MEAN 256 MAX 1,540 MIN 72 CFSM 1.01 IN 13.73
WTR YR 1970 TOTAL 105,010 MEAN 288 MAX 1,460 MIN 42 CFSM 1.14 IN 15.44

05127000 Kawishiwi River near Winton, Minn.

LOCATION.--Lat 47°56'05", long 91°45'50", in NE¼NW¼ sec.20, T.63 N., R.11 W., Lake County, at powerplant of Minnesota Power & Light Co., just upstream from Fall Lake, and 1.8 miles east of Winton.

DRAINAGE AREA.--1,200 sq mi, approximately.

PERIOD OF RECORD.--June 1905 to June 1907, October 1912 to September 1919 (fragmentary), September 1923 to current year. Monthly discharge only for some periods, published in WSP 1308.

AVERAGE DISCHARGE (UNADJUSTED).--51 years (1905-06, 1915-17, 1918-19, 1923-70), 998 cfs (11.29 inches per year).

EXTREMES.--Current year: Maximum daily discharge, 6,780 cfs May 8; minimum, no flow Sept. 6.
Period of record: Maximum daily discharge, 16,000 cfs May 18, 1950; no flow at times.

REMARKS.--Records good except those above 2,000 cfs, which are fair. Daily discharge computed from powerplant records. Flow regulated by powerplant and by Camp Six, Bald Eagle, Gabbro, Little Gabbro, Birch, White Iron, South Farm, and Garden Lakes.

COOPERATION.--Records collected by Minnesota Power & Light Co., under general supervision of Geological Survey, in connection with a Federal Power Commission project.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	901	866	928	499	337	402	480	3,980	5,040	1,370	252	244
2	836	866	960	469	390	402	480	4,750	4,860	1,200	129	670
3	868	866	992	469	369	370	448	5,470	4,740	1,220	279	389
4	804	950	1,020	469	369	467	444	5,770	4,510	1,220	167	346
5	836	992	960	501	369	341	398	6,620	4,320	1,220	134	261
6	836	1,020	992	469	337	371	427	6,490	4,110	1,220	167	0
7	836	1,020	992	469	337	338	459	6,550	3,680	1,380	135	129
8	901	1,060	960	501	337	368	459	6,780	3,370	1,090	97	174
9	836	1,020	960	469	337	368	459	6,750	3,250	933	97	174
10	804	1,020	895	469	337	374	459	6,650	4,640	988	200	206
11	804	1,060	863	469	337	336	459	6,500	5,990	956	135	206
12	836	960	891	469	337	379	459	6,390	6,440	956	168	206
13	836	1,090	799	469	337	400	459	6,030	6,630	1,090	135	303
14	771	960	863	469	305	368	459	5,680	6,540	956	285	206
15	804	992	790	437	337	336	556	5,270	6,260	1,220	238	271
16	836	992	730	469	337	400	755	4,840	5,430	1,090	64	206
17	804	960	640	404	337	368	742	4,720	5,480	988	154	271
18	804	960	621	404	337	304	831	4,220	4,820	831	256	206
19	836	960	491	404	340	394	912	4,080	4,420	799	147	206
20	804	960	463	469	372	507	1,010	3,850	4,180	795	177	271
21	770	960	375	404	436	531	1,220	4,090	3,690	859	209	864
22	802	960	435	402	402	561	1,230	5,600	3,280	988	115	407
23	785	960	477	337	370	529	1,450	5,320	2,700	891	129	349
24	695	895	546	369	338	560	1,560	5,150	2,540	859	80	238
25	727	960	551	337	402	527	1,760	5,260	2,550	769	274	330
26	716	863	537	402	402	527	1,850	5,090	2,450	633	145	297
27	762	928	467	337	402	527	2,260	4,980	2,380	628	177	350
28	729	960	499	402	370	545	2,400	5,010	2,270	531	80	350
29	746	928	499	337	------	512	2,920	5,170	1,950	494	149	317
30	803	895	499	337	------	480	3,380	5,170	1,840	374	147	447
31	834	------	467	337	------	480	------	5,170	------	342	147	------
TOTAL	24,962	28,883	22,162	13,248	10,017	13,372	31,185	167,400	124,360	28,890	5,068	8,894
MEAN	805	963	715	427	358	431	1,040	5,400	4,145	932	163	296
MAX	901	1,090	1,020	501	436	561	3,380	6,780	6,630	1,380	285	864
MIN	695	863	375	337	305	304	398	3,850	1,840	342	64	0
(≠)	-95	+62	-107	-25	-84	-195	+329	+221	+45	-18	-30	-36
MEAN ≠	710	1,025	608	402	274	236	1,369	5,621	4,190	914	133	260
CFSM ≠	0.59	0.85	0.51	0.34	0.23	0.20	1.14	4.68	3.49	0.76	0.11	0.22
IN. ≠	0.68	0.95	0.58	0.39	0.24	0.23	1.27	5.40	3.90	0.88	0.13	0.24

CAL YR 1969	TOTAL	519,940	MEAN	1,424	MAX	8,620	MIN	226	MEAN ≠	1,408	CFSM ≠	1.17	IN. ≠	15.93
WAT YR 1970	TOTAL	478,441	MEAN	1,311	MAX	6,780	MIN	0	MEAN ≠	1,316	CFSM ≠	1.10	IN. ≠	14.89

≠ Changes in contents, equivalent in cubic feet per second, in Camp Six, Bald Eagle, Gabbro, Little Gabbro, Birch, White Iron, Farm, South Farm, and Garden Lakes.
≠ Adjusted for change in reservoir contents.

05127205 Burntside River near Ely, Minn.

LOCATION.--Lat 47°54'55", long 91°56'59", in NE¼NE¼ sec.26, T.63 N., R.13 W., St. Louis County, on left bank on downstream wingwall of bridge on County Road 88, 2.5 miles upstream from mouth, 4 miles northwest of Ely and 5 miles downstream from outlet on Burntside Lake.

PERIOD OF RECORD.--May 1967 to current year.

GAGE.--Nonrecording gage read once daily. Altitude of gage is 1,340 ft (from topographic map).

EXTREMES.--Current year: Maximum discharge, 455 cfs June 12 (gage height, 8.59 ft, from floodmark); minimum observed, 6.4 cfs Oct. 24 (gage height, 5.55 ft).
Period of record: Maximum discharge, 455 cfs June 12, 1970 (gage height, 8.59 ft, from floodmark); minimum daily discharge, 0.8 cfs Oct. 6, 7, 1967.

REMARKS.--Records good except those for winter months, which are fair.

COOPERATION.--Gage readings furnished by the Water Quality Office, Environmental Protection Agency.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	10	18	18	20	18	16	172	260	139	76	12
2	17	13	18	18	20	18	16	170	250	128	68	25
3	17	15	17	17	20	18	15	164	241	120	61	40
4	17	16	17	17	20	18	15	160	230	112	55	40
5	16	17	17	17	19	18	16	163	221	105	53	36
6	16	17	17	17	19	18	16	161	210	103	52	34
7	16	17	18	16	18	18	17	156	200	103	50	32
8	16	18	18	16	18	18	18	160	191	113	48	30
9	15	18	19	16	18	18	20	158	185	111	46	29
10	15	18	20	16	17	18	22	157	330	107	44	38
11	15	18	20	16	17	18	26	154	412	111	43	37
12	15	18	20	16	17	18	30	145	448	117	41	32
13	15	18	20	16	17	18	34	142	440	124	38	30
14	14	18	20	16	17	18	36	139	412	118	36	28
15	13	18	20	16	17	17	40	132	388	139	34	28
16	13	19	20	16	17	17	44	130	367	134	32	27
17	12	19	19	16	17	17	42	126	339	128	31	24
18	11	19	19	17	17	17	41	124	313	124	29	21
19	9.0	19	19	17	17	17	48	118	293	122	26	20
20	7.6	19	18	17	17	17	60	122	275	120	22	30
21	7.5	18	18	17	17	17	57	222	255	113	19	41
22	7.2	18	18	17	17	17	63	326	241	110	21	36
23	7.6	18	18	17	17	17	70	333	223	103	20	41
24	6.4	19	17	18	17	17	76	333	213	100	18	49
25	7.3	19	17	18	17	17	92	319	202	97	17	58
26	8.5	19	17	18	17	17	110	303	188	94	16	56
27	8.3	19	18	19	17	16	138	277	175	90	14	50
28	8.0	19	18	19	17	16	156	282	165	92	13	43
29	7.6	18	18	20	------	16	165	272	153	87	13	41
30	7.2	18	18	20	------	16	172	272	149	83	12	40
31	8.0	------	18	20	------	16	------	263	------	79	12	------
TOTAL	370.3	529	569	534	495	536	1,671	6,155	7,969	3,426	1,060	1,048
MEAN	11.9	17.6	18.4	17.2	17.7	17.3	55.7	199	266	111	34.2	34.9
MAX	17	19	20	20	20	18	172	333	448	139	76	58
MIN	6.4	10	17	16	17	16	15	118	149	79	12	12

CAL YR 1969 TOTAL 22,886.3 MEAN 62.7 MAX 233 MIN 6.4
WAT YR 1970 TOTAL 24,362.3 MEAN 66.7 MAX 443 MIN 6.4

05127210 Armstrong Creek near Ely, Minn.

LOCATION (revised).--Lat 47°53'48", long 91°55'50", in SW¼NE¼ sec.36, T.63 N., R.13 W., St. Louis County, near right bank 50 ft upstream from culvert on County Road 88, 1.2 miles upstream from mouth and 2.5 miles southwest of Ely.

DRAINAGE AREA.--5.29 sq mi.

PERIOD OF RECORD.--May 1967 to current year.

GAGE.--Nonrecording gage read once daily and crest-stage gage. Altitude of gage is 1,365 ft (from topographic map). Prior to Oct. 1, 1969, at site 100 ft downstream at same datum.

EXTREMES.--Current year: Maximum discharge, 131 cfs May 21 (gage height, 5.88 ft, from floodmark); minimum daily, 0.2 cfs Mar. 28 to Apr. 4.
Period of record: Maximum discharge, 131 cfs May 21, 1970 (gage height, 5.88 ft, from floodmark); no flow Feb. 28 to Mar. 6, 1968.

REMARKS.--Records good except those for winter months, which are fair.

COOPERATION.--Gage readings furnished by Water Quality Office, Environmental Protection Agency.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.7	8.5	1.1	.50	.70	.30	.20	31	17	2.1	1.0	.90
2	1.6	7.7	1.1	.50	.80	.30	.20	27	16	2.0	1.0	12
3	1.3	6.3	1.0	.40	.80	.30	.20	23	14	3.1	.90	7.3
4	1.4	5.2	1.0	.40	.80	.30	.20	21	12	2.3	.90	3.2
5	1.6	4.6	1.0	.40	.80	.30	.40	20	8.6	1.7	.90	1.6
6	1.3	4.2	.90	.40	.80	.30	1.2	18	7.4	1.5	.80	1.1
7	1.3	4.0	.90	.40	.80	.30	8.0	16	6.6	1.7	.80	.90
8	1.4	3.8	.90	.40	.80	.30	11	14	6.0	4.0	.80	.80
9	1.2	3.5	.80	.40	.70	.30	13	23	5.5	2.6	.70	.80
10	1.3	3.0	.80	.30	.70	.30	12	20	50	2.0	.70	1.6
11	1.4	2.6	.80	.30	.70	.30	11	17	94	1.6	.60	1.2
12	1.5	2.3	.80	.30	.70	.30	10	15	56	1.4	.50	.90
13	1.3	2.1	.70	.30	.70	.30	10	13	35	17	.50	.70
14	1.2	2.0	.70	.30	.70	.30	11	11	23	14	.50	.70
15	1.0	1.9	.70	.30	.60	.40	13	14	18	29	.60	1.0
16	1.0	1.8	.70	.30	.60	.40	18	19	14	24	.80	1.0
17	1.3	1.7	.70	.30	.60	.40	19	15	12	14	.60	.80
18	1.1	1.7	.70	.30	.60	.40	17	12	11	10	.60	.90
19	1.0	1.6	.70	.30	.50	.40	15	10	9.2	8.5	.60	1.5
20	.90	1.6	.60	.30	.50	.40	14	11	7.8	6.0	.50	13
21	.90	1.5	.60	.30	.50	.40	14	106	6.7	4.5	.40	20
22	.90	1.5	.60	.30	.50	.40	16	75	5.7	3.4	.30	14
23	.80	1.5	.60	.40	.40	.40	15	42	4.8	2.8	.40	11
24	.80	1.4	.60	.40	.40	.30	18	31	4.8	2.2	.40	5.4
25	2.0	1.4	.60	.50	.40	.30	26	27	4.0	2.0	.40	3.9
26	2.5	1.3	.60	.50	.40	.30	31	24	4.0	2.4	.30	3.3
27	1.9	1.2	.60	.60	.30	.30	36	21	3.6	2.0	1.1	3.0
28	1.6	1.2	.50	.60	.30	.20	48	17	3.4	1.6	.50	2.1
29	1.4	1.2	.50	.60	------	.20	84	15	3.0	1.4	.40	1.6
30	1.4	1.2	.50	.70	------	.20	37	19	2.5	1.3	.60	1.6
31	2.9	------	.50	.70	------	.20	------	19	------	1.1	.70	------
TOTAL	42.90	83.5	22.80	12.70	17.10	9.80	509.40	746	465.6	173.2	19.80	117.80
MEAN	1.38	2.78	.74	.41	.61	.32	17.0	24.1	15.5	5.59	.64	3.93
MAX	2.9	8.5	1.1	.70	.80	.40	84	106	94	29	1.1	20
MIN	.80	1.2	.50	.30	.30	.20	.20	10	2.5	1.1	.30	.70

CAL YR 1969 TOTAL 1,775.10 MEAN 4.86 MAX 61 MIN .50
WAT YR 1970 TOTAL 2,220.60 MEAN 6.08 MAX 106 MIN .20

05127215 Longstorff Creek near Ely, Minn.

LOCATION.--Lat 47°53'33", long 91°54'55", in SE¼SW¼ sec.31, T.63 N., R.12 W., St. Louis County, left bank on downstream side of culvert of U.S. Highway 169, 0.7 mile upstream from mouth, 1.5 miles southwest of Ely and 2.5 miles downstream from outlet of Mitchell Lake.

DRAINAGE AREA.--8.84 sq mi.

PERIOD OF RECORD.--May 1967 to current year.

GAGE.--Nonrecording gage read once daily and crest-stage gage. Datum of gage is 1,360.67 ft above mean sea level, datum of 1929 (levels by Minnesota Highway Department).

EXTREMES.--Current year: Maximum discharge, 230 cfs June 10 (gage height, 6.52 ft, from floodmark); minimum, 0.3 cfs Aug. 26 (gage height, 0.56 ft).
Period of record: Maximum discharge, 230 cfs June 10, 1970 (gage height, 6.52 ft, from floodmark); no flow on many days in 1968 and May 7, 1969.

REMARKS.--Records good.

COOPERATION.--Gage readings furnished by Water Quality Office, Environmental Protection Agency.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.2	6.0	1.7	1.4	1.3	1.2	1.6	49	33	3.2	1.3	.80
2	1.2	5.5	1.7	1.3	1.3	1.2	1.5	42	28	2.9	1.1	7.7
3	.90	5.0	1.6	1.3	1.3	1.3	1.5	35	24	3.5	1.0	5.3
4	1.0	4.4	1.6	1.2	1.3	1.3	1.5	31	24	2.8	1.0	3.6
5	1.7	3.9	1.5	1.2	1.3	1.4	1.7	29	17	2.1	.90	2.7
6	1.5	3.5	1.6	1.2	1.3	1.5	2.3	26	14	2.2	.90	2.2
7	1.3	3.4	1.7	1.2	1.3	1.4	5.2	22	11	3.0	.80	2.1
8	1.5	3.2	1.8	1.2	1.3	1.4	12	19	12	5.3	.80	1.6
9	1.3	3.0	1.8	1.1	1.3	1.4	15	28	14	3.9	.70	1.0
10	1.3	2.8	1.9	1.1	1.3	1.3	13	24	178	2.8	.70	2.4
11	1.2	2.6	2.0	1.1	1.3	1.4	12	21	208	4.4	.70	1.8
12	1.1	2.5	2.0	1.1	1.3	1.3	11	18	141	12	.70	1.5
13	1.1	2.4	2.0	1.1	1.3	1.3	12	16	76	14	.70	1.2
14	1.0	2.3	1.9	1.1	1.3	1.3	14	17	50	13	.70	1.0
15	1.0	2.2	1.9	1.1	1.2	1.3	17	20	36	32	1.0	1.2
16	1.0	2.2	2.0	1.2	1.2	1.3	24	22	28	18	.90	1.7
17	1.1	2.3	2.2	1.2	1.2	1.4	26	19	23	9.8	.70	1.5
18	1.1	2.3	2.2	1.3	1.2	1.3	25	17	21	7.0	.50	1.3
19	1.1	2.3	2.2	1.3	1.2	1.3	20	15	18	5.0	.70	1.5
20	1.1	2.2	2.1	1.3	1.2	1.4	18	40	15	4.7	.50	20
21	1.1	2.1	2.1	1.3	1.2	1.5	18	203	13	3.9	.50	14
22	1.1	2.0	2.0	1.3	1.2	1.6	20	147	11	3.5	.70	8.7
23	.90	2.0	1.9	1.3	1.2	1.8	24	80	10	2.6	.60	5.3
24	.90	2.0	1.9	1.3	1.2	2.0	24	59	9.6	3.2	.50	4.0
25	1.3	2.0	1.8	1.3	1.2	2.0	40	52	8.1	2.7	.50	3.4
26	2.6	1.9	1.8	1.3	1.2	2.0	64	45	7.4	3.6	.30	5.0
27	2.2	1.9	1.7	1.3	1.2	1.8	59	38	7.0	2.8	.50	4.7
28	1.8	1.9	1.7	1.4	1.2	1.7	55	31	5.8	1.7	.50	3.2
29	1.8	1.8	1.6	1.3	------	1.6	61	27	5.5	1.7	.40	2.0
30	1.8	1.8	1.6	1.3	------	1.6	56	79	4.0	2.0	.40	2.4
31	2.9	------	1.5	1.3	------	1.6	------	71	------	1.6	.50	------
TOTAL	42.10	83.4	57.0	38.4	35.0	45.9	655.3	1,342	1,052.4	180.9	21.70	114.80
MEAN	1.36	2.78	1.84	1.24	1.25	1.48	21.8	43.3	35.1	5.84	.70	3.83
MAX	2.9	6.0	2.2	1.4	1.3	2.0	64	203	208	32	1.3	20
MIN	.90	1.8	1.5	1.1	1.2	1.2	1.5	15	4.0	1.6	.30	.80

CAL YR 1969 TOTAL 2,974.90 MEAN 8.15 MAX 120 MIN .90
WAT YR 1970 TOTAL 3,668.90 MEAN 10.1 MAX 208 MIN .30

05127220 Burgo Creek near Ely, Minn.

LOCATION.--Lat 47°55'32", long 91°51'40", in SW¼NW¼ sec.22, T.63 N., R.12 W., St. Louis County, near right bank 6 ft upstream from twin culverts on County Road 88, 0.5 mile upstream from mouth and 1.5 miles north of Ely.

DRAINAGE AREA.--3.04 sq mi.

PERIOD OF RECORD.--May 1967 to current year.

GAGE.--Nonrecording gage and crest-stage gage; gage read once daily. Altitude of gage is 1,340 ft (from topographic map).

EXTREMES.--Current year: Maximum discharge, 732 cfs June 10 (gage height, 12.14 ft, from floodmark), from rating curve extended above 150 cfs on basis of flow through culvert and flow-over-road measurement of peak flow; minimum daily, 0.1 cfs on several days in February, March, and August.
Period of record: Maximum discharge, 732 cfs June 10, 1970 (gage height, 12.14 ft, from floodmark), from rating curve extended above 150 cfs on basis of flow through culvert and flow-over-road measurement of peak flow; no flow at times in 1967, 1968.

REMARKS.--Records fair.

COOPERATION.--Gage readings furnished by Water Quality Office, Environmental Protection Agency.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.40	3.0	1.0	.30	.30	.10	.40	15	14	.50	.30	.20
2	.40	3.9	1.1	.30	.30	.20	.40	11	13	.40	.30	1.3
3	.40	3.3	1.2	.30	.20	.20	.30	9.5	12	.60	.20	.90
4	.40	3.3	1.1	.30	.20	.20	.30	8.6	10	.50	.20	.60
5	.50	3.0	1.0	.30	.20	.20	.40	8.0	11	.30	.20	.50
6	.80	2.8	.90	.30	.20	.20	.50	7.3	8.5	.30	.20	.40
7	1.0	2.7	.90	.30	.20	.20	2.0	5.8	6.5	.30	.20	.40
8	1.0	2.5	.90	.30	.20	.20	12	5.4	5.4	2.6	.20	.30
9	1.0	2.2	.80	.30	.20	.10	15	8.5	5.2	1.4	.20	.30
10	.90	1.9	.80	.30	.20	.10	14	7.8	153	.70	.20	.50
11	.90	1.8	.80	.30	.20	.10	12	6.2	52	.50	.20	.40
12	1.0	1.7	.80	.20	.20	.20	10	5.4	29	.80	.20	.40
13	1.2	1.7	.80	.20	.10	.20	11	5.0	24	.60	.20	.30
14	1.2	1.6	.70	.20	.10	.20	12	3.7	21	.50	.20	.30
15	1.0	1.6	.70	.20	.10	.20	13	4.2	18	5.4	.50	.40
16	1.0	1.5	.70	.20	.10	.20	17	5.5	17	3.1	.30	.40
17	1.0	1.5	.60	.20	.10	.20	19	4.0	15	1.6	.20	.30
18	1.0	1.5	.60	.20	.10	.30	18	3.2	13	.90	.20	.30
19	1.1	1.4	.60	.20	.10	.30	15	2.6	11	.60	.10	.30
20	1.1	1.4	.60	.20	.10	.30	12	73	8.4	.70	.10	1.0
21	1.1	1.3	.60	.20	.10	.30	11	140	6.6	.70	.10	12
22	1.2	1.2	.50	.20	.10	.40	11	34	4.8	.60	.40	13
23	1.2	1.1	.50	.30	.10	.40	12	23	4.0	.50	.30	10
24	1.0	1.1	.50	.30	.10	.40	13	20	2.3	.40	.20	8.2
25	1.3	1.0	.50	.30	.10	.40	40	19	1.6	.40	.20	6.6
26	2.2	1.0	.40	.30	.10	.40	68	17	1.4	.30	.10	6.0
27	1.7	1.0	.40	.30	.10	.40	53	16	1.0	.30	.20	8.0
28	1.4	1.0	.40	.30	.10	.40	40	13	.80	.30	.10	5.8
29	1.5	1.0	.40	.30	------	.40	25	12	.70	.30	.10	3.1
30	1.5	1.0	.30	.30	------	.40	19	16	.60	.30	.20	2.4
31	1.8	------	.30	.30	------	.40	------	15	------	.30	.20	------
TOTAL	33.20	55.0	21.40	8.20	4.20	8.20	476.30	524.7	470.80	26.70	6.50	84.60
MEAN	1.07	1.83	.69	.26	.15	.26	15.9	16.9	15.7	.86	.21	2.82
MAX	2.2	3.9	1.2	.30	.30	.40	68	140	153	5.4	.50	13
MIN	.40	1.0	.30	.20	.10	.10	.30	2.6	.60	.30	.10	.20

CAL YR 1969 TOTAL 1,099.20 MEAN 3.01 MAX 67 MIN .10
WAT YR 1970 TOTAL 1,719.80 MEAN 4.71 MAX 153 MIN .10

05127225 Shagawa Lake at Ely, Minn.

LOCATION.--Lat 47°54'18", long 91°53'00", in NE¼NE¼ sec.33, T.63 N., R.12 W., St. Louis County, on south shore of Shagawa Lake, on east pier of dock at U.S. Forest Service Seaplane Base in Ely.

PERIOD OF RECORD.--April 1967 to current year. April 1962 to July 1966 (fragmentary) in files of Minnesota Department of Conservation, Division of Waters, Soils and Minerals.

GAGE.--Nonrecording gage read once daily. Datum of gage is 1,330.00 ft above mean sea level, adjustment of 1929 (levels by Minnesota Department of Conservation). Gage readings have been reduced to elevations above mean sea level.

EXTREMES.--Current year: Maximum elevation observed, 1,340.22 ft June 13; minimum observed, 1,337.25 ft Oct. 24.
Period of record: Maximum elevation observed, 1,340.22 ft June 13, 1970; minimum observed, 1,336.91 ft Feb. 26, 1968.
Maximum elevation observed April 1962 to July 1966, 1,339.95 ft Apr. 27, 28, 1966, from Minnesota Department of Conservation, Division of Waters, Soils, and Minerals.

COOPERATION.--Gage readings furnished by Water Quality Office, Environmental Protection Agency and U.S. Forest Service.

DAILY ELEVATIONS, IN FEET, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Oct. 31	1337.33	Feb. 27	1337.29	June 30	1338.97
Nov. 28	1337.44	Mar. 31	1337.30	July 31	1338.15
Dec. 31	1337.40	Apr. 30	1338.91	Aug. 31	1337.35
Jan. 30	1337.35	May 31	1339.62	Sept.30	1337.68

NOTE.--Elevations other than those shown are available.

05127230 Shagawa River at Ely, Minn.

LOCATION.--Lat 47°55'09", long 91°50'08", in SW¼SW¼ sec.23, T.63 N., R.12 W., St. Louis County, on right bank, 300 ft downstream from outlet of Shagawa Lake, 150 ft north of the village limits of Ely, 0.8 mile upstream from County Road 88 and 3 miles upstream from Fall Lake.

PERIOD OF RECORD.--May 1967 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,335 ft (from topographic map). Prior to Aug. 2, 1967, non-recording gage at same site and datum.

EXTREMES.--Current year: Maximum discharge, 640 cfs June 12 (gage height, 6.89 ft); minimum, 20 cfs Oct. 24 (gage height, 4.17 ft).
Period of record: Maximum discharge, 640 cfs June 12, 1970 (gage height, 6.89 ft); minimum, 6.2 cfs Mar. 4, 1968 (gage height, 3.74 ft).

REMARKS.--Records good.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	28	28	34	29	30	26	26	262	388	251	111	25
2	28	29	34	29	30	25	25	270	374	245	104	40
3	26	31	33	28	29	28	25	277	363	230	95	49
4	27	32	32	28	30	28	26	279	348	222	87	49
5	28	32	31	27	28	28	25	279	336	211	83	47
6	29	33	32	27	28	28	26	279	327	203	81	46
7	31	34	34	25	28	28	27	277	312	205	75	47
8	30	34	35	25	28	28	31	268	301	209	73	45
9	27	34	36	25	28	28	34	264	290	207	69	46
10	29	34	36	25	27	28	36	262	395	199	67	48
11	27	35	36	27	27	27	39	258	536	192	64	45
12	26	35	36	27	27	27	42	253	615	192	60	44
13	25	35	36	27	27	27	43	243	635	203	57	42
14	27	35	36	27	27	27	47	236	620	205	56	41
15	25	37	36	29	27	26	51	232	585	222	55	42
16	24	35	36	29	27	26	57	230	550	228	51	43
17	24	36	36	29	27	26	65	226	514	222	46	42
18	24	37	35	30	27	25	69	220	483	207	43	41
19	22	37	34	29	26	25	73	216	441	203	42	39
20	22	36	34	30	26	25	80	232	411	201	43	37
21	21	35	34	30	26	25	86	395	388	194	38	58
22	21	36	34	29	27	25	90	487	369	188	39	63
23	20	36	33	30	26	25	101	509	351	176	38	61
24	20	36	32	32	26	25	104	504	332	168	38	60
25	21	36	33	31	25	25	111	509	314	162	36	62
26	25	34	32	32	27	25	127	478	305	154	34	61
27	25	34	32	33	27	25	158	449	292	150	34	60
28	24	34	31	33	26	25	197	434	281	142	32	59
29	23	34	31	33	------	25	224	411	272	131	30	59
30	23	34	30	32	------	27	247	408	260	127	28	58
31	25	------	30	32	------	26	------	395	------	123	28	------
TOTAL	777	1,028	1,044	899	764	814	2,292	10,042	11,988	5,972	1,737	1,459
MEAN	25.1	34.3	33.7	29.0	27.3	26.3	76.4	324	400	193	56.0	48.6
MAX	31	37	36	33	30	28	247	509	635	251	111	63
MIN	20	28	30	25	25	25	25	216	260	123	28	25

CAL YR 1969 TOTAL 34,724 MEAN 95.1 MAX 358 MIN 20
WAT YR 1970 TOTAL 38,816 MEAN 106 MAX 635 MIN 20

05127500 Basswood River near Winton, Minn.

(International gaging station)

LOCATION.--Lat 48°04'55", long 91°39'10", in sec.30, T.65 N., R.10 W., Lake County, on island in Jackfish Bay of Basswood Lake, used to determine discharge at outlet (lat 48°06', long 91°39', in sec.19, T.65 N., R.10 W., on international boundary 14 miles northeast of Winton).

DRAINAGE AREA.--1,740 sq mi, approximately (above outlet of Basswood Lake).

RECORDS AVAILABLE.--March to June 1924, September 1925 to March 1928, January 1930 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 1,296.80 ft above mean sea level, adjustment of 1928, by Geodetic Survey of Canada. Prior to Oct. 27, 1938, nonrecording gages at several sites in vicinity of gage, at datum 3.0 ft higher. Oct. 28, 1938, to Sept. 30, 1966, water-stage recorder at datum 3.0 ft higher.

AVERAGE DISCHARGE.--42 years (1925-27, 1930-70), 1,355 cfs (10.58 inches per year).

EXTREMES.--Current year: Maximum discharge, 7,120 cfs June 17 (gage height, 6.97 ft); minimum, 333 cfs Sept. 1 (gage height, 2.61 ft).
Period of record: Maximum discharge, 15,600 cfs May 24, 1950 (gage height, 9.94 ft, present datum); minimum, 73 cfs Dec. 5, 1948.

REMARKS.--Records excellent except those for period of no gage-height record, which are fair. Flow affected by storage on Kawishiwi River.

COOPERATION.--This station is maintained by the United States under agreement with Canada.

REVISIONS (WATER YEARS).--WSP 955: Drainage area. WSP 1145: 1935, 1937.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	871	870	1,000	790	625	555	665	2,700	6,590	4,060	1,300	340
2	867	880	1,000	770	620	560	665	2,990	6,570	3,790	1,210	433
3	876	880	1,000	780	620	560	660	3,260	6,500	3,590	1,140	445
4	868	890	1,000	760	615	560	664	3,550	6,400	3,400	1,080	442
5	873	890	1,000	751	610	555	671	3,850	6,250	3,220	1,020	448
6	880	900	1,000	741	605	555	677	4,170	6,070	3,080	974	445
7	873	900	1,020	732	600	550	681	4,470	5,880	3,030	928	445
8	865	910	1,050	722	595	550	681	4,790	5,680	2,980	882	436
9	867	910	1,060	722	590	545	685	5,150	5,500	2,880	840	426
10	862	920	1,070	713	590	540	687	5,420	5,910	2,760	792	433
11	862	920	1,060	713	585	540	687	5,660	6,180	2,640	752	429
12	856	920	1,060	703	580	535	688	5,830	6,440	2,540	712	406
13	843	920	1,060	703	575	535	689	5,960	6,610	2,440	677	399
14	827	940	1,060	694	565	530	691	6,050	6,750	2,350	644	391
15	824	940	1,060	713	560	525	702	6,090	6,890	2,310	610	389
16	819	950	1,060	703	560	525	734	6,070	7,010	2,240	567	380
17	816	970	1,040	703	555	525	759	6,000	7,060	2,170	555	374
18	806	990	1,020	694	550	525	790	5,880	6,990	2,130	526	370
19	820	990	1,000	694	545	530	824	5,740	6,860	2,070	496	369
20	810	1,000	990	684	545	530	878	5,600	6,680	2,000	469	364
21	820	1,000	960	675	540	535	954	5,700	6,430	1,930	456	453
22	800	1,000	930	675	540	545	1,010	5,910	6,200	1,870	443	441
23	810	1,000	900	665	540	555	1,140	6,110	5,890	1,810	436	458
24	800	1,000	880	665	545	570	1,220	6,310	5,550	1,740	422	462
25	820	1,000	870	657	545	575	1,310	6,430	5,280	1,690	410	463
26	840	1,010	860	648	550	585	1,410	6,510	5,040	1,650	398	458
27	830	1,010	850	648	550	600	1,580	6,530	4,830	1,610	388	455
28	830	1,010	840	640	550	610	1,840	6,530	4,660	1,560	374	453
29	820	1,010	830	635	------	625	2,110	6,560	4,460	1,510	367	443
30	810	1,000	810	630	------	635	2,430	6,600	4,300	1,440	356	448
31	830	------	800	630	------	655	------	6,590	------	1,370	348	------
TOTAL	25,995	28,530	30,140	21,653	16,050	17,320	29,182	169,010	181,460	73,860	20,572	12,698
MEAN	839	951	972	698	573	559	973	5,452	6,049	2,383	664	423
MAX	880	1,010	1,070	790	625	655	2,430	6,600	7,060	4,060	1,300	463
MIN	800	870	800	630	540	525	660	2,700	4,300	1,370	348	340
CFSM	.48	.55	.56	.40	.33	.32	.56	3.13	3.48	1.37	.38	.24
IN.	.56	.61	.64	.46	.34	.37	.62	3.61	3.88	1.58	.44	.27

CAL YR 1969 TOTAL 644,853 MEAN 1,767 MAX 7,910 MIN 746 CFSM 1.02 IN 13.78
WTR YR 1970 TOTAL 626,470 MEAN 1,716 MAX 7,060 MIN 340 CFSM .99 IN 13.39

NOTE.--No gage-height record Jan. 28 to Mar. 31.

05128000 Namakan River at outlet of Lac la Croix, Ontario

(International gaging station)

LOCATION.--Lat 48°23'00", long 92°10'40", at Campbell's Camp, 2.5 miles west of outlet of Lac la Croix.

DRAINAGE AREA.--5,170 sq mi.

PERIOD OF RECORD.--September 1921 to January 1922, April 1922 to current year, in reports of Geological Survey. Monthly discharge only for some periods, published in WSP 1308. August 1921 to current year, in reports of Water Survey of Canada, Inland Waters Branch.

GAGE.--Water-stage recorder. Gage readings have been reduced to elevations above mean sea level, United States and Canada Boundary Survey datum. Prior to October 1933, nonrecording gages at various sites on Lac la Croix. October 1933 to March 13, 1963, nonrecording gage at present site and datum.

AVERAGE DISCHARGE.--48 years (1922-70), 3,710 cfs (9.74 inches per year).

EXTREMES.--Current year: Maximum discharge, 16,400 cfs June 20 (elevation, 1,189.63 ft); minimum, 1,520 cfs Apr. 7 (elevation, 1,182.73 ft).
Period of record: Maximum discharge, 28,200 cfs May 31 to June 2, 1950 (elevation, 1,193.30 ft); minimum, 535 cfs at times in February, March and April 1924 (elevation, 1,181.50 ft).

REMARKS.--Records excellent.

COOPERATION.--This station is maintained by Canada under agreement with the United States.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2,670	2,120	2,190	2,250	1,950	1,700	1,590	4,530	15,100	14,500	6,800	2,680
2	2,630	2,130	2,180	2,220	1,940	1,700	1,590	4,970	15,300	14,100	6,500	2,810
3	2,630	2,140	2,170	2,220	1,940	1,710	1,580	5,420	15,400	13,800	6,320	2,810
4	2,570	2,140	2,170	2,190	1,920	1,720	1,580	5,820	15,400	13,500	6,150	2,750
5	2,530	2,160	2,170	2,170	1,900	1,720	1,590	6,210	15,500	13,200	5,930	2,740
6	2,530	2,160	2,160	2,160	1,890	1,730	1,600	6,610	15,400	12,800	5,760	2,680
7	2,490	2,160	2,180	2,140	1,890	1,720	1,590	6,980	15,400	12,400	5,570	2,670
8	2,480	2,160	2,220	2,130	1,870	1,720	1,590	7,440	15,300	12,200	5,400	2,670
9	2,480	2,160	2,230	2,130	1,860	1,710	1,600	7,990	15,200	11,800	5,190	2,630
10	2,450	2,160	2,250	2,120	1,840	1,700	1,610	8,450	15,300	11,400	5,030	2,570
11	2,450	2,130	2,250	2,110	1,840	1,690	1,620	8,880	15,400	11,300	4,850	2,580
12	2,430	2,130	2,260	2,100	1,840	1,690	1,630	9,310	15,500	11,000	4,700	2,510
13	2,390	2,130	2,280	2,080	1,830	1,680	1,630	9,810	15,600	10,900	4,550	2,490
14	2,340	2,140	2,280	2,070	1,830	1,680	1,660	10,200	15,700	10,600	4,420	2,470
15	2,310	2,130	2,280	2,080	1,820	1,670	1,690	10,700	15,900	10,500	4,230	2,450
16	2,280	2,180	2,300	2,080	1,830	1,660	1,740	11,000	15,900	10,200	4,070	2,410
17	2,270	2,180	2,310	2,070	1,820	1,660	1,800	11,500	16,100	9,940	4,030	2,410
18	2,220	2,180	2,310	2,060	1,800	1,650	1,860	11,800	16,100	9,710	3,860	2,390
19	2,220	2,180	2,310	2,050	1,790	1,650	1,950	12,100	16,200	9,460	3,730	2,350
20	2,170	2,180	2,320	2,020	1,780	1,640	2,050	12,500	16,300	9,190	3,620	2,340
21	2,160	2,180	2,310	2,010	1,770	1,640	2,160	12,800	16,200	8,950	3,540	2,360
22	2,120	2,180	2,320	2,000	1,730	1,630	2,260	13,000	16,200	8,730	3,440	2,250
23	2,110	2,180	2,320	1,990	1,730	1,630	2,430	13,100	16,100	8,500	3,380	2,320
24	2,070	2,180	2,320	2,000	1,720	1,620	2,540	13,300	16,000	8,250	3,280	2,300
25	2,080	2,190	2,340	2,000	1,710	1,620	2,680	13,400	15,900	8,020	3,190	2,260
26	2,080	2,190	2,340	2,000	1,710	1,610	2,840	13,600	15,800	7,760	3,070	2,210
27	2,070	2,190	2,320	2,000	1,710	1,610	3,030	13,800	15,600	7,580	2,980	2,210
28	2,070	2,190	2,320	2,000	1,700	1,610	3,300	14,100	15,400	7,420	2,910	2,210
29	2,070	2,190	2,320	2,000	------	1,600	3,660	14,200	15,000	7,280	2,850	2,160
30	2,060	2,180	2,320	1,980	------	1,600	4,100	14,500	14,900	7,230	2,790	2,190
31	2,080	------	2,300	1,960	------	1,590	------	14,800	------	7,000	2,740	------
TOTAL	71,510	64,900	70,350	64,390	50,960	51,560	62,550	322,820	469,100	319,220	134,880	73,880
MEAN	2,307	2,163	2,269	2,077	1,820	1,663	2,085	10,410	15,640	10,300	4,351	2,463
MAX	2,670	2,190	2,340	2,250	1,950	1,730	4,100	14,800	16,300	14,500	6,800	2,810
MIN	2,060	2,120	2,160	1,960	1,700	1,590	1,580	4,530	14,900	7,000	2,740	2,160
CFSM	.45	.42	.44	.40	.35	.32	.40	2.01	3.03	1.99	.84	.48
IN.	.51	.47	.51	.46	.37	.37	.45	2.32	3.38	2.30	.97	.53

CAL YR 1969 TOTAL 1,773,960 MEAN 4,860 MAX 15,100 MIN 2,060 CFSM .94 IN 12.76
WTR YR 1970 TOTAL 1,756,120 MEAN 4,811 MAX 16,300 MIN 1,580 CFSM .93 IN 12.64

05128200 Vermilion Lake near Soudan, Minn.

LOCATION.--Lat 47°49'52", long 92°16'20", in SW¼SE¼ sec.20, T.62 N., R.15 W., St. Louis County, on south shore of Vermilion Lake, at McKinley Park, 2 miles northwest of Soudan.

PERIOD OF RECORD.--October 1913 to July 1915, July 1941 to November 1942, June 1946 to current year (fragmentary during 1947).

GAGE.--Water-stage recorder. Datum of gage is 1,355.10 ft above mean sea level, datum of 1929. October 1913 to July 1915, nonrecording gage 2 miles southwest of present gage at Tower, at datum about 0.5 ft lower. July 1941 to November 1942 and June 1946 to June 1951, nonrecording gage approximately 13 miles northwest at Vermilion Dam near Tower, at same datum. All gage readings have been reduced to elevations above mean sea level, datum of 1929.

EXTREMES.--Current year: Maximum elevation, 1,359.26 ft June 16; maximum daily, 1,359.22 ft June 14; minimum, 1,356.87 ft Sept. 19.

Period of record: Maximum elevation observed, 1,359.52 ft May 16, 1950; minimum observed, 1,356.02 ft Jan. 29, 1942.

Elevation on June 6, 1913, was 1,359.94 ft (determined from reference point set by local observers).

MONTHEND ELEVATION, IN FEET, OCTOBER 1969 TO SEPTEMBER 1970

Oct. 31	1,357.28	Feb. 28	1,357.09	June 30	1,358.61
Nov. 30	1,357.35	Mar. 31	1,357.05	July 31	1,357.72
Dec. 31	1,357.28	Apr. 30	1,358.30	Aug. 31	1,357.00
Jan. 31	1,357.20	May 31	1,358.73	Sept.30	1,356.93

NOTE.--Elevations other than those shown above are available.

05129000 Vermilion River below Vermilion Lake, near Tower, Minn.

LOCATION.--Lat 47°57'41", long 92°28'33", in SE¼SW¼ sec.2, T.63 N., R.17 W., St. Louis County, on left bank 200 ft downstream from dam at outlet of Vermilion Lake, 4.4 miles upstream from Twomile Creek, and 14.2 miles northwest of Tower.

DRAINAGE AREA.--483 sq mi.

PERIOD OF RECORD.--May 1911 to September 1917, June 1928 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,347.36 ft above mean sea level, datum of 1929. June 26, 1928, to July 8, 1931, nonrecording gage at same site, at datum 3.05 ft higher. May 17, 1911, to Sept. 30, 1917, July 9, 1931, to Apr. 11, 1939, nonrecording gages, and Apr. 12, 1939, to Sept. 30, 1967, water-stage recorder at same site, at datum 3.00 ft higher.

AVERAGE DISCHARGE.--48 years, 312 cfs (8.77 inches per year).

EXTREMES.--Current year: Maximum daily discharge, 1,730 cfs June 14; minimum discharge, 47 cfs Sept. 29 (gage height, 3.12 ft).
Period of record: Maximum discharge, 2,710 cfs May 23, 1950 (gage height, 7.68 ft, present datum); no flow Oct. 25-29, 1955, caused by temporary storage behind new concrete dam at outlet of Vermilion Lake.

REMARKS.--Records good except those for periods of no gage-height record, which are fair.

REVISIONS (WATER YEARS).--WSP 1508: 1913.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	223	212	236	205	162	131	85	840	1,530	1,040	352	74
2	213	221	230	203	159	129	84	905	1,520	983	310	108
3	232	229	225	202	159	140	82	960	1,500	925	294	104
4	224	233	224	200	159	144	80	998	1,470	911	284	102
5	212	247	223	198	161	142	80	1,040	1,430	892	268	112
6	223	247	223	195	158	144	83	1,060	1,380	860	261	107
7	209	251	230	192	155	140	85	1,070	1,320	846	250	111
8	200	257	245	191	153	136	88	1,090	1,270	816	239	104
9	210	253	253	190	155	134	91	1,100	1,240	806	227	103
10	211	258	251	187	150	131	98	1,100	1,450	778	214	79
11	205	247	247	186	148	129	103	1,100	1,590	761	204	92
12	204	243	246	184	147	125	105	1,090	1,680	757	199	77
13	194	229	243	183	147	124	110	1,090	1,710	758	191	73
14	194	241	240	181	148	120	113	1,080	1,730	736	187	73
15	195	239	238	185	146	117	118	1,060	1,700	716	170	75
16	184	256	238	185	149	117	122	1,050	1,640	705	146	70
17	186	257	233	184	146	113	125	1,040	1,600	673	156	72
18	181	258	230	182	143	110	133	1,020	1,530	669	149	70
19	186	258	228	178	143	106	142	1,010	1,530	626	121	79
20	175	265	227	175	144	103	151	1,020	1,490	607	107	72
21	179	267	223	175	143	102	161	1,150	1,430	594	115	103
22	171	261	217	172	139	100	195	1,260	1,420	584	99	82
23	185	261	216	171	138	97	220	1,300	1,390	565	99	93
24	179	263	219	167	134	96	235	1,330	1,280	525	93	87
25	179	255	221	165	136	92	250	1,450	1,290	484	92	88
26	184	253	218	165	137	90	270	1,500	1,240	469	92	78
27	186	254	214	167	135	90	310	1,520	1,200	450	85	75
28	197	246	213	166	134	87	400	1,500	1,190	443	78	77
29	198	242	215	168	------	85	550	1,470	1,100	434	84	69
30	199	237	213	168	------	85	700	1,480	1,110	403	70	74
31	205	------	209	165	------	87	------	1,510	------	378	72	------
TOTAL	6,123	7,440	7,088	5,635	4,128	3,546	5,369	36,193	42,960	21,194	5,308	2,583
MEAN	198	248	229	182	147	114	179	1,168	1,432	684	171	86.1
MAX	232	267	253	205	162	144	700	1,520	1,730	1,040	352	112
MIN	171	212	209	165	134	85	80	840	1,100	378	70	69
CFSM	.41	.51	.47	.38	.30	.24	.37	2.42	2.96	1.42	.35	.18
IN.	.47	.57	.55	.43	.32	.27	.41	2.79	3.31	1.63	.41	.20

CAL YR 1969 TOTAL 175,325 MEAN 480 MAX 1,520 MIN 171 CFSM .99 IN 13.50
WTR YR 1970 TOTAL 147,567 MEAN 404 MAX 1,730 MIN 69 CFSM .84 IN 11.37

NOTE.--No gage-height record May 5 to June 11, June 13-15.

05129400 Rainy Lake near Fort Frances, Ontario

(International gaging station)

LOCATION.--Lat 48°38'30", long 93°20'00", at Five Mile dock, approximately 5 miles northeast of town of Fort Frances.

PERIOD OF RECORD.--January 1910 to September 1917 and October 1934 to current year in reports of Geological Survey. August 1911 to September 1970 in reports of Water Survey of Canada, Inland Waters Branch. Prior to October 1949, published as "at Ranier, Minn.", and as "at Fort Frances, Ontario" October 1949 to September 1964.

GAGE.--Water-stage recorder. Datum of gage is at mean sea level (United States and Canadian Boundary Survey). January 1910 to December 1949, nonrecording gage 3 miles northeast at Ranier, Minn., at same datum. January 1950 to October 1964, water-stage recorder on Government dock at Pither's Point at Fort Frances and supplementary gage in town pumping station, 0.5 mile south, used during winter months, at same datum.

EXTREMES.--Current year: Maximum elevation, 1,109.03 ft June 24; minimum, 1,103.80 ft Apr. 13.
Period of record: Maximum elevation observed, 1,112.97 ft July 5, 1950; minimum observed, 1,101.26 ft Apr. 17, 1923, Apr. 2, 1930.

COOPERATION.--This station is maintained by Canada under agreement with the United States.

MONTHEND ELEVATION, IN FEET, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Oct. 31	7.88	Feb. 28	5.28	June 30	8.89
Nov. 30	7.72	Mar. 31	4.11	July 31	8.09
Dec. 31	6.94	Apr. 30	5.35	Aug. 31	7.76
Jan. 31	6.26	May 31	7.91	Sept.30	7.59

NOTE.--Add 1,100 ft to obtain elevation above mean sea level. Elevations other than those shown are available.

05130500 Sturgeon River near Chisholm, Minn.

LOCATION.--Lat 47°40'25", long 92°54'00", in NE¼NW¼ sec.20, T.60 N., R.20 W., St. Louis County, on left bank 1,000 ft upstream from highway bridge, 0.6 mile downstream from East Branch Sturgeon River, and 11.5 miles north of Chisholm.

DRAINAGE AREA.--187 sq mi.

PERIOD OF RECORD.--August 1942 to current year. Monthly discharge only for Aug. 1942 [illegible]

GAGE.--Water-stage recorder. Datum of gage is 1,306.7 ft above mean sea level, datum of 1929. Prior to Aug. 24, 1944, nonrecording gage at site 1,000 ft downstream at different datum.

AVERAGE DISCHARGE.--28 years, 122 cfs (8.86 inches per year).

EXTREMES.--Current year: Maximum discharge, 1,500 cfs Apr. 29 (gage height, 4.62 ft); minimum, 14 cfs Aug. 13, 14; minimum gage height, 0.22 ft Aug. 14.
Period of record: Maximum discharge, 3,630 cfs May 7, 1950 (gage height, 6.41 ft), from rating curve extended above 1,600 cfs on basis of slope-area measurement of peak flow; minimum daily, 6.0 cfs Feb. 18-27, 1944; minimum gage height, 0.08 ft Jan. 28 to Feb. 1, 1963.

REMARKS.--Records good except those for winter periods, which are fair.

REVISIONS (WATER YEARS).--WSP 1438: 1946.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	130	150	66	49	28	26	36	1,060	402	153	37	19
2	126	181	66	49	27	25	36	874	382	144	35	20
3	121	198	64	47	29	26	35	728	351	137	32	22
4	103	186	61	46	29	25	36	609	312	134	30	22
5	109	178	60	44	28	25	36	535	275	130	24	22
6	110	183	60	43	26	25	42	477	246	123	21	21
7	110	176	60	41	26	25	65	432	223	116	19	21
8	107	167	59	41	26	25	120	397	205	112	19	21
9	104	156	58	40	26	26	170	398	187	106	18	20
10	103	146	57	39	25	28	260	406	477	101	17	22
11	107	138	58	38	25	28	330	408	678	96	16	22
12	107	132	59	37	25	28	400	393	615	90	16	21
13	106	125	59	36	25	26	430	367	498	87	15	20
14	104	92	59	35	25	26	465	339	416	82	15	19
15	100	82	58	34	24	26	473	334	362	89	16	19
16	98	94	59	33	24	26	496	338	331	81	15	20
17	98	90	59	32	24	25	513	334	309	74	17	20
18	95	84	59	32	24	25	505	313	294	69	17	20
19	92	74	58	31	24	24	476	286	282	71	19	19
20	89	72	58	31	25	24	376	288	261	68	18	19
21	85	72	58	30	25	25	366	466	245	66	23	23
22	84	72	57	30	26	25	358	478	234	62	25	23
23	78	74	57	30	26	26	358	438	220	57	24	23
24	82	75	56	29	26	28	387	405	209	53	23	21
25	85	74	56	29	26	30	513	395	199	51	22	20
26	100	72	55	29	27	31	763	394	195	49	21	21
27	104	70	55	28	26	32	1,110	372	188	46	20	21
28	104	71	54	28	26	34	1,430	341	182	43	20	20
29	103	69	51	28	------	35	1,470	340	174	41	19	19
30	103	68	50	28	------	36	1,290	389	163	40	20	18
31	124	------	50	28	------	35	------	401	------	39	20	------
TOTAL	3,171	3,421	1,796	1,095	723	851	13,345	13,735	9,115	2,610	653	618
MEAN	102	114	57.9	35.3	25.8	27.5	445	443	304	84.2	21.1	20.6
MAX	130	198	66	49	29	36	1,470	1,060	678	153	37	23
MIN	78	68	50	28	24	24	35	286	163	39	15	18
CFSM	.55	.61	.31	.19	.14	.15	2.38	2.37	1.63	.45	.11	.11
IN.	.63	.68	.36	.22	.14	.17	2.65	2.73	1.81	.52	.13	.12

CAL YR 1969 TOTAL 59,708 MEAN 164 MAX 2,160 MIN 32 CFSM .88 IN 11.88
WTR YR 1970 TOTAL 51,133 MEAN 140 MAX 1,470 MIN 15 CFSM .75 IN 10.17

PEAK DISCHARGE (BASE, 500 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
4-17	0730	2.84	513	6-11	0830	3.29	728
4-29	0145	4.62	1,500				

05131000 Dark River near Chisholm, Minn.

LOCATION.--Lat 47°41'27", long 92°49'15", in SW¼SW¼ sec.12, T.60 N., R.20 W., St. Louis County, on right bank 50 ft downstream from remains of abandoned highway bridge, 3.5 miles upstream from mouth, and 12.2 miles northeast of Chisholm.

DRAINAGE AREA.--50.6 sq mi.

PERIOD OF RECORD.--August 1942 to September 1961, October 1965 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,316.8 ft above mean sea level, datum of 1929 (surveyed by Topographic Division). Prior to Aug. 24, 1944, nonrecording gage at site 50 ft upstream at same datum.

AVERAGE DISCHARGE.--24 years, 36.8 cfs (9.88 inches per year).

EXTREMES.--Current year: Maximum discharge, 398 cfs Apr. 29 (gage height, 4.44 ft); minimum, 8.0 cfs Aug. 11, 12 (gage height, 1.33 ft).
Period of record: Maximum discharge, 1,170 cfs May 7, 1950 (gage height, 7.10 ft); minimum, 0.3 cfs Aug. 3, 1956; minimum gage height, 0.87 ft Mar. 22, 23, 1949, Aug. 16, 17, 1961.

REMARKS.--Records good.

COOPERATION.--Records for 1970 water year computed by U.S. Steel Corporation and reviewed by Geological Survey.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	38	45	22	18	14	13	15	311	103	34	11	11
2	36	50	22	18	13	13	15	274	100	29	9.8	11
3	35	52	22	18	12	14	15	239	94	27	9.3	12
4	34	54	21	18	11	15	15	204	84	27	9.1	11
5	33	55	20	18	12	17	15	176	73	24	8.9	11
6	33	56	20	18	12	17	16	148	66	24	8.9	11
7	31	54	20	17	12	17	21	129	58	22	9.1	11
8	30	52	21	17	12	17	44	112	52	24	8.7	11
9	29	48	22	17	12	16	53	96	45	22	8.7	11
10	29	46	21	16	13	16	56	88	203	21	8.7	11
11	31	43	21	16	12	16	73	88	199	20	8.7	11
12	29	41	21	16	12	15	82	91	149	19	8.5	11
13	27	37	21	15	12	15	88	89	132	18	8.5	10
14	26	35	21	14	12	14	89	84	126	17	9.8	9.3
15	26	33	20	14	12	14	93	85	120	24	10	9.8
16	25	32	20	15	12	13	93	85	111	20	9.3	11
17	24	31	20	14	12	13	92	80	100	19	9.3	10
18	24	30	20	13	12	12	89	76	90	18	9.5	10
19	23	30	20	13	12	12	84	72	83	21	9.3	9.8
20	23	29	20	12	12	12	85	79	76	19	8.9	10
21	24	28	20	12	12	13	78	165	70	19	9.1	14
22	24	27	19	11	13	13	74	156	63	17	11	13
23	23	27	19	11	14	13	76	137	56	16	10	13
24	23	27	19	11	14	14	79	133	51	16	10	12
25	25	27	19	11	14	14	113	128	46	14	10	13
26	29	25	19	11	13	15	149	125	45	14	9.1	13
27	29	24	18	12	13	15	245	115	41	13	8.9	13
28	30	24	18	12	13	15	354	107	41	13	9.1	12
29	30	23	17	13	------	14	390	104	38	12	9.1	11
30	30	23	18	13	------	15	352	108	36	12	9.1	11
31	35	------	17	13	------	14	------	104	------	12	10	------
TOTAL	888	1,108	618	447	349	446	3,043	3,988	2,551	607	289.4	337.9
MEAN	28.6	36.9	19.9	14.4	12.5	14.4	101	129	85.0	19.6	9.34	11.3
MAX	38	56	22	18	14	17	390	311	203	34	11	14
MIN	23	23	17	11	11	12	15	72	36	12	8.5	9.3
CFSM	.57	.73	.39	.28	.25	.28	2.00	2.55	1.68	.39	.18	.22
IN.	.65	.81	.45	.33	.26	.33	2.24	2.93	1.88	.45	.21	.25

CAL YR 1969 TOTAL 17,123.9 MEAN 46.9 MAX 582 MIN 8.7 CFSM .93 IN 12.59
WTR YR 1970 TOTAL 14,672.3 MEAN 40.2 MAX 390 MIN 8.5 CFSM .79 IN 10.79

05131500 Little Fork River at Littlefork, Minn.

LOCATION.--Lat 48°23'55", long 93°33'56", in NW¼ sec.9, T.68 N., R.25 W., Koochiching County, on left bank 100 ft downstream from highway bridge at town of Littlefork, 0.3 mile downstream from bridge on State Highway 217, 1.5 miles upstream from Beaver Creek, and 18 miles upstream from mouth.

DRAINAGE AREA.--1,730 sq mi, approximately.

PERIOD OF RECORD.--June to November 1909, April to November 1910, April 1911 to June 1917, September 1917, October 1917 to March 1919 (gage heights only), June 1928 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,073.06 ft above mean sea level, datum of 1929. June 23, 1909, to Mar. 4, 1917, nonrecording gage at same site and datum. Mar. 5 to Sept. 30, 1917, and June 22, 1928, to July 20, 1937, nonrecording gage, at site 100 ft upstream at same datum. Nonrecording gage 1.2 miles upstream at datum 9.0 ft higher (used as supplementary gage during periods of backwater from Rainy River).

AVERAGE DISCHARGE.--47 years (1911-16, 1928-70), 1,022 cfs (8.02 inches per year).

EXTREMES.--Current year: Maximum discharge, 17,300 cfs June 14 (gage height, 31.08 ft, backwater from Rainy River); minimum discharge, 84 cfs Aug. 21 (gage height, 5.30 ft).
Period of record: Maximum discharge, 25,000 cfs Apr. 18, 1916, May 11, 1950 (gage height, 37.00 ft); minimum daily, 15 cfs Feb. 9-22, 1963.

REMARKS.--Records good except those for winter months, which are fair.

REVISIONS (WATER YEARS).--WSP 955: Drainage area. WSP 1913, 1916, 1928-32, 1934.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1,510	1,550	816	481	127	125	220	14,100	5,030	932	242	103
2	1,680	2,200	750	480	124	126	220	11,600	5,710	862	226	113
3	1,670	2,720	708	479	123	129	218	8,850	4,920	784	209	119
4	1,560	2,770	668	476	123	131	216	7,120	4,160	718	196	161
5	3,210	2,590	638	475	123	133	213	6,110	3,370	676	191	154
6	6,570	2,360	606	471	123	136	213	5,410	2,780	626	185	147
7	6,060	2,140	592	467	122	139	220	4,840	2,290	605	178	195
8	4,980	1,970	582	454	122	142	263	4,410	1,980	590	172	203
9	4,080	1,820	566	446	121	147	480	4,080	1,710	575	165	199
10	3,450	1,680	560	428	121	151	1,170	3,980	2,250	565	137	188
11	3,160	1,560	558	409	120	154	1,760	3,980	8,370	637	124	167
12	2,990	1,450	556	380	120	158	2,800	3,910	13,200	570	109	151
13	2,730	1,340	552	354	120	161	3,440	3,770	15,900	610	102	147
14	2,470	1,230	544	332	119	163	3,980	3,480	17,100	632	109	139
15	2,190	1,060	540	311	119	165	4,480	3,140	15,100	595	114	141
16	1,930	960	538	283	119	166	4,920	3,310	8,510	600	107	143
17	1,750	1,110	536	265	119	167	5,320	3,410	5,110	610	105	150
18	1,580	1,150	534	248	120	169	5,480	3,230	4,100	580	95	151
19	1,460	1,190	530	229	120	170	4,680	3,010	3,370	550	93	143
20	1,340	1,220	527	211	120	171	4,120	2,770	2,950	525	90	135
21	1,260	1,230	522	197	120	173	3,660	2,540	2,580	500	89	175
22	1,190	1,240	519	187	120	177	3,460	3,750	2,220	480	98	323
23	1,130	1,240	516	178	120	179	3,700	4,580	1,940	416	98	452
24	1,060	1,230	508	171	121	181	4,470	4,380	1,720	380	95	418
25	1,040	1,210	504	162	122	184	6,680	4,020	1,440	364	92	364
26	1,110	1,180	501	153	122	193	9,680	3,900	1,320	329	88	319
27	1,210	1,140	499	144	123	201	11,900	3,890	1,240	308	91	285
28	1,270	1,040	492	138	124	210	12,800	3,680	1,140	285	92	258
29	1,300	960	487	134	------	215	13,900	3,440	1,120	267	89	234
30	1,300	880	483	132	------	219	14,800	3,570	1,010	261	115	214
31	1,310	------	482	129	------	220	------	4,210	------	248	108	------
TOTAL	69,550	45,420	17,414	9,404	3,397	5,155	129,463	146,470	143,640	16,680	4,004	6,091
MEAN	2,244	1,514	562	303	121	166	4,315	4,725	4,788	538	129	203
MAX	6,570	2,770	816	481	127	220	14,800	14,100	17,100	932	242	452
MIN	1,040	880	482	129	119	125	213	2,540	1,010	248	88	103
CFSM	1.30	.88	.32	.18	.07	.10	2.49	2.73	2.77	.31	.07	.12
IN.	1.50	.98	.37	.20	.07	.11	2.78	3.15	3.09	.36	.09	.13

CAL YR 1969 TOTAL 683,256 MEAN 1,872 MAX 20,600 MIN 235 CFSM 1.08 IN 14.69
WTR YR 1970 TOTAL 596,688 MEAN 1,635 MAX 17,100 MIN 88 CFSM .94 IN 12.83

NOTE.--Backwater from Rainy River Apr. 28 to May 2, May 11 to July 24.

05132000 Big Fork River at Big Falls, Minn.

LOCATION.--Lat 48°11'45", long 93°48'25", in sec.35, T.155 N., R.25 W., Koochiching County, on left bank at village of Big Falls, 700 ft downstream from falls, 0.3 mile downstream from bridge on U.S. Highway 71, and 4.8 miles upstream from Sturgeon River.

DRAINAGE AREA.--1,460 sq mi, approximately.

PERIOD OF RECORD.--August to November 1909, April to November 1910, April 1911 to September 1912 (gage heights and discharge measurements only), June 1928 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,144.71 ft above mean sea level, datum of 1929. Prior to June 10, 1911, nonrecording gage at railroad bridge about 0.4 mile upstream at different datum. June 10, 1911, to Dec. 17, 1937, nonrecording gage at site 200 ft upstream at same datum.

AVERAGE DISCHARGE.--42 years (1928-1970), 683 cfs (6.35 inches per year).

EXTREMES.--Current year: Maximum discharge, 10,100 cfs Apr. 29 (gage height, 13.13 ft); minimum, 131 cfs Sept. 1, 2 (gage height, 3.02 ft).
Period of record: Maximum discharge, 14,800 cfs May 8, 9, 1950; maximum gage height, 17.08 ft May 8, 1950; minimum discharge recorded, 7 cfs Aug. 7, 1939.

REMARKS.--Records good except those for period of no gage-height record and those for winter months, which are fair.

REVISIONS (WATER YEARS).--WSP 1308: 1935(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	880	1,560	830	590	210	220	280	8,490	3,450	770	256	132
2	918	1,810	810	580	210	225	275	6,910	4,180	740	241	133
3	916	1,910	790	575	210	225	270	5,670	4,060	710	227	141
4	895	1,920	765	570	210	230	270	4,840	3,600	680	216	142
5	2,560	1,860	755	560	210	235	265	4,310	3,060	660	206	143
6	5,180	1,780	740	550	205	240	265	3,900	2,590	640	200	140
7	5,540	1,700	720	540	205	245	270	3,610	2,200	620	192	175
8	5,140	1,630	710	530	205	250	305	3,410	1,920	600	185	169
9	4,520	1,570	705	515	205	255	420	3,270	1,690	590	179	160
10	3,900	1,510	700	485	210	255	850	3,220	1,920	580	187	157
11	3,530	1,460	700	465	210	260	1,400	3,140	4,250	590	180	156
12	3,240	1,410	690	440	210	260	1,700	3,020	5,960	600	165	157
13	2,900	1,360	685	410	210	265	1,950	2,900	5,530	610	162	166
14	2,620	1,270	680	380	205	270	2,300	2,750	4,860	620	167	164
15	2,360	1,140	680	365	205	270	2,600	2,710	4,060	610	186	173
16	2,150	970	675	335	205	270	3,100	2,960	3,240	590	178	177
17	1,990	854	670	310	205	270	3,640	3,100	2,720	560	174	176
18	1,840	690	665	295	205	270	4,110	3,020	2,350	520	167	172
19	1,710	700	660	285	205	270	3,760	2,850	2,080	470	162	168
20	1,610	770	660	275	205	265	2,640	2,600	1,820	450	156	165
21	1,530	1,000	655	265	210	265	2,100	2,420	1,620	410	158	270
22	1,470	1,080	650	260	210	260	2,160	2,300	1,450	380	175	407
23	1,390	1,050	650	250	210	260	2,310	2,260	1,270	355	176	385
24	1,330	1,020	645	240	210	265	2,750	2,260	1,110	330	165	360
25	1,320	1,000	640	235	210	270	4,330	2,260	1,020	306	155	354
26	1,360	960	630	230	215	280	6,340	2,400	950	290	147	346
27	1,390	920	625	225	215	285	8,180	2,600	910	276	142	328
28	1,380	900	620	220	215	285	9,720	2,650	880	267	136	311
29	1,360	880	610	220	------	290	10,000	2,600	840	253	133	294
30	1,350	850	605	215	------	290	9,610	2,830	800	242	148	283
31	1,380	------	600	215	------	285	------	2,880	------	254	139	------
TOTAL	69,659	37,534	21,220	11,630	5,840	8,085	88,170	104,140	76,390	15,573	5,462	6,504
MEAN	2,247	1,251	685	375	209	261	2,939	3,359	2,546	502	176	217
MAX	5,540	1,920	830	590	215	290	10,000	8,490	5,960	770	256	407
MIN	880	690	600	215	205	220	265	2,260	800	242	133	132
CFSM	1.54	.86	.47	.26	.14	.18	2.01	2.30	1.74	.34	.12	.15
IN.	1.77	.96	.54	.30	.15	.21	2.25	2.65	1.95	.40	.14	.17

CAL YR 1969 TOTAL 477,011 MEAN 1,307 MAX 13,100 MIN 235 CFSM .90 IN 12.15
WTR YR 1970 TOTAL 450,207 MEAN 1,233 MAX 10,000 MIN 132 CFSM .84 IN 11.47

NOTE.--No gage-height record June 22 to July 23.

05133500 Rainy River at Manitou Rapids, Minn.

(International gaging station)

LOCATION.--Lat 48°38'04", long 93°54'47", in sec.36, T.160 N., R.26 W., Koochiching County, on left bank at Manitou Rapids, 3.5 miles east of Mantiou Post Office and 4 miles west of Indus.

DRAINAGE AREA.--19,400 sq mi, approximately.

PERIOD OF RECORD.--July 1928 to current year. Monthly discharge only for some periods, published in WSP 1308. October 1911 to October 1924 (gage heights only) at site near Birchdale in files of Corps of Engineers. Published as "near Birchdale" 1932-34.

GAGE.--Water-stage recorder. Datum of gage is 1,062.48 ft above mean sea level, datum of 1929. Prior to Nov. 10, 1934, nonrecording gage at site near Birchdale 7 miles downstream at different datum.

AVERAGE DISCHARGE.--42 years, 12,620 cfs (8.83 inches per year).

EXTREMES.--Current year: Maximum discharge, 57,000 cfs June 15 (gage height, 18.09 ft); minimum, 6,880 cfs Aug. 23 (gage height, 3.69 ft).
Period of record: Maximum discharge, 71,600 cfs May 12, 1950 (gage height, 21.04 ft); minimum daily, 928 cfs Dec. 26, 1929.

REMARKS.--Records good except those for winter months, which are fair. Diurnal fluctuation caused by power-plant at International Falls. Some regulation at low and medium flows by Rainy and Namakan Lakes. Records of chemical analyses for the water year 1970 are published in Part 2 of this report.

COOPERATION.--This station is maintained by the United States under agreement with Canada.

REVISIONS (WATER YEARS).--WSP 1055: 1944.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10,900	11,800	15,500	12,400	11,600	11,400	11,000	43,600	38,700	33,700	11,700	8,480
2	11,700	12,200	15,500	12,500	11,800	10,700	10,600	40,600	41,100	33,200	11,700	8,140
3	11,800	14,400	15,400	12,700	11,700	11,300	10,000	34,300	40,800	32,800	11,600	7,890
4	11,800	14,600	15,400	12,600	11,700	11,000	9,880	27,400	40,600	32,800	11,300	8,390
5	12,900	14,700	15,300	12,600	11,700	11,000	9,760	24,800	39,400	32,400	11,100	8,910
6	19,200	14,700	15,300	12,400	11,800	11,100	9,750	23,000	37,800	32,000	10,900	7,830
7	24,300	14,100	15,100	12,400	11,800	11,300	9,950	21,700	36,500	31,600	10,900	7,450
8	25,600	13,900	15,200	12,400	11,800	11,500	10,200	20,000	35,500	31,400	10,900	8,980
9	24,800	13,400	14,800	12,400	11,400	11,300	10,800	21,000	34,900	31,300	10,900	8,120
10	23,000	13,300	15,100	12,400	11,800	11,600	11,000	19,000	37,200	31,000	10,800	8,590
11	22,200	13,100	15,000	12,400	11,700	11,800	11,700	17,600	40,200	30,700	10,800	8,140
12	21,500	13,500	15,000	12,400	11,500	11,700	13,400	21,100	47,800	30,500	10,700	8,150
13	20,800	13,400	15,000	11,500	11,700	11,400	15,000	29,100	53,500	30,300	9,210	8,530
14	20,200	13,600	15,000	11,300	11,600	11,400	16,500	29,500	56,100	30,200	8,660	7,970
15	19,300	14,300	15,100	11,400	11,600	11,300	16,400	31,000	56,700	30,000	9,600	8,270
16	18,500	13,800	15,000	11,300	9,940	10,700	16,800	32,100	53,400	29,000	8,710	8,520
17	17,700	13,500	15,000	11,200	11,400	11,200	17,100	32,700	46,700	26,400	8,860	8,550
18	16,300	13,900	15,000	11,100	11,300	11,200	18,200	32,400	42,500	23,600	9,770	9,140
19	15,200	13,900	14,800	11,100	11,400	11,200	20,200	32,200	40,400	22,300	9,420	8,870
20	14,300	13,900	14,900	11,000	11,200	11,200	17,600	32,700	39,000	21,900	9,730	8,100
21	13,900	14,100	13,100	11,100	11,200	11,200	16,400	32,700	37,900	19,700	9,300	7,850
22	14,000	14,100	12,900	11,100	11,200	11,000	15,800	33,400	37,000	15,600	8,260	8,110
23	13,600	14,200	12,800	11,100	10,500	11,100	16,600	34,700	36,100	13,400	7,190	8,400
24	13,300	14,300	12,800	11,000	11,500	11,000	18,900	35,100	35,500	12,700	7,200	8,730
25	13,400	14,300	11,800	11,000	11,500	10,700	23,000	34,700	35,100	12,600	7,950	8,690
26	12,900	14,100	11,300	11,000	11,400	10,600	27,200	34,700	34,800	12,400	8,150	8,540
27	12,800	13,900	12,900	11,100	11,400	10,800	31,400	35,000	34,500	12,100	8,200	8,560
28	12,300	15,400	12,700	11,000	11,400	11,000	36,600	35,300	34,400	12,000	8,130	8,600
29	12,200	15,800	12,800	10,600	------	11,200	40,200	35,200	34,200	11,000	8,160	8,720
30	12,000	15,700	12,900	10,800	------	11,100	43,200	35,700	33,900	10,900	8,480	8,620
31	11,500	------	12,800	10,900	------	11,000	------	36,400	------	11,700	8,290	------
TOTAL	503,900	419,900	441,200	360,200	320,540	346,000	535,140	948,700	1,212.2M	741,200	296,570	251,840
MEAN	16,250	14,000	14,230	11,620	11,450	11,160	17,840	30,600	40,410	23,910	9,567	8,395
MAX	25,600	15,800	15,500	12,700	11,800	11,800	43,200	43,600	56,700	33,700	11,700	9,140
MIN	10,900	11,800	11,300	10,600	9,940	10,600	9,750	17,600	33,900	10,900	7,190	7,450
CFSM	.84	.72	.73	.60	.59	.58	.92	1.58	2.08	1.23	.49	.43
IN.	.97	.80	.85	.69	.61	.66	1.03	1.82	2.32	1.42	.57	.48

CAL YR 1969 TOTAL 6,825,690 MEAN 18,700 MAX 57,900 MIN 7,150 CFSM .96 IN 13.08
WTR YR 1970 TOTAL 6,377,390 MEAN 17,470 MAX 56,700 MIN 7,190 CFSM .90 IN 12.23

05134200 Rapid River near Baudette, Minn.

LOCATION.--Lat 48°32'10", long 94°33'45", in NE¼ sec.1, T.158 N., R.31 W., Lake of the Woods County, on left bank 20 ft upstream from bridge on State Highway 72, 1.2 miles downstream from North Branch Rapid River, and 12 miles south of Baudette.

DRAINAGE AREA.--543 sq mi.

PERIOD OF RECORD.--October 1956 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,093.92 ft above mean sea level, datum of 1929 (Minnesota Highway Department bench mark).

AVERAGE DISCHARGE.--14 years, 347 cfs (8.68 inches per year).

EXTREMES.--Current year: Maximum discharge, 3,470 cfs Apr. 29 (gage height, 13.26 ft); minimum, 4.8 cfs Aug. 21, 29 (gage height, 1.56 ft).
Period of record: Maximum discharge, 5,500 cfs Apr. 14, 1969 (gage height, 17.86 ft); minimum, 0.1 cfs Aug. 13, 1961 (gage height, 1.18 ft).
Flood of May 11, 1950, reached a stage of 21.1 ft, from information by local residents and Minnesota Highway Department (discharge, about 7,000 cfs).

REMARKS.--Records good except those for winter months, which are fair.

REVISIONS (WATER YEARS).--WSP 1913: 1962, 1965(M), 1966.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	23	218	48	33	20	18	21	3,150	1,270	525	38	14
2	28	248	48	33	20	18	21	2,800	1,170	448	28	23
3	42	252	47	32	20	18	21	2,450	1,040	372	21	25
4	46	242	46	32	20	18	24	2,190	918	328	16	21
5	97	230	45	32	19	18	30	2,040	818	287	13	17
6	230	218	44	32	19	18	34	1,910	712	236	11	12
7	292	209	43	31	19	18	39	1,760	615	207	10	30
8	300	206	42	31	19	18	56	1,630	540	217	9.7	41
9	288	197	42	31	19	18	81	1,640	799	200	9.1	32
10	353	189	41	30	19	19	140	1,670	2,490	174	8.1	49
11	488	184	41	30	19	19	258	1,730	2,640	150	7.3	53
12	504	183	40	30	19	19	452	1,790	2,790	134	6.5	45
13	482	162	39	29	19	19	755	1,780	2,870	159	6.2	40
14	443	126	39	28	18	19	1,200	1,680	2,770	198	6.2	38
15	401	100	39	27	18	20	1,620	1,860	2,420	189	5.8	35
16	380	82	39	26	18	21	1,870	2,150	2,190	180	5.3	38
17	362	70	38	25	18	21	1,840	2,140	2,200	153	5.0	47
18	339	59	37	24	18	22	1,530	1,960	2,320	125	5.0	49
19	308	53	37	23	18	22	1,270	1,720	2,430	104	5.0	47
20	282	50	36	23	18	23	930	1,510	2,380	89	5.0	42
21	266	48	36	23	18	24	838	1,400	2,150	77	5.5	36
22	248	48	36	22	18	24	930	1,290	1,840	69	6.8	30
23	228	48	35	22	18	24	1,240	1,200	1,470	61	6.5	31
24	214	50	35	22	18	24	1,810	1,120	1,140	51	6.5	29
25	211	52	35	22	18	24	2,730	1,130	911	43	6.0	26
26	219	52	34	21	18	23	3,060	1,490	818	37	5.5	23
27	219	51	34	21	18	23	2,880	1,700	762	31	5.8	20
28	204	50	34	21	18	22	3,060	1,680	684	29	5.3	18
29	194	48	33	20	------	22	3,410	1,560	610	26	5.3	17
30	212	48	33	20	------	21	3,400	1,500	550	31	12	16
31	223	------	33	20	------	21	------	1,390	------	42	12	------
TOTAL	8,126	3,773	1,209	816	521	638	35,550	55,020	46,317	4,972	298.4	944
MEAN	262	126	39.0	26.3	18.6	20.6	1,185	1,775	1,544	160	9.63	31.5
MAX	504	252	48	33	20	24	3,410	3,150	2,870	525	38	53
MIN	23	48	33	20	18	18	21	1,120	540	26	5.0	12
CFSM	.48	.23	.072	.048	.034	.038	2.18	3.27	2.84	.29	.018	.058
IN.	.56	.26	.08	.06	.04	.04	2.44	3.77	3.17	.34	.02	.06

CAL YR 1969 TOTAL 129,959.0 MEAN 356 MAX 5,480 MIN 11 CFSM .66 IN 8.90
WTR YR 1970 TOTAL 158,184.4 MEAN 433 MAX 3,410 MIN 5.0 CFSM .80 IN 10.84

05139500 Warroad River near Warroad, Minn.

LOCATION.--Lat 48°52'00", long 95°21'20", in SE¼NE¼ sec.12, T.162 N., R.37 W., Roseau County, on downstream hand-rail of bridge near center of span, 0.5 mile upstream from Bulldog Run and 2.5 miles south of Warroad.

DRAINAGE AREA.--110 sq mi, approximately.

PERIOD OF RECORD.--March 1946 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Nonrecording gage read daily, and crest-stage gage. Datum of gage is 1,070.74 ft above mean sea level, datum of 1929 (levels by Stanley Johnson, consulting engineer and instructor at University of North Dakota).

AVERAGE DISCHARGE.--24 years, 45.2 cfs (5.58 inches per year).

EXTREMES.--Current year: Maximum discharge, 1,040 cfs Apr. 29 (gage height, 8.19 ft); minimum, 0.3 cfs Aug. 20 (gage height, 1.64 ft).
Period of record: Maximum discharge, 1,780 cfs Apr. 15, 1965 (gage height, 9.95 ft); no flow at times.

REMARKS.--Records good except those for period of no gage-height record and those for winter months, which are fair.

REVISIONS (WATER YEARS).--WSP 1308: 1949(M). WSP 1508: 1947(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.9	9.6	4.8	4.1	4.3	2.8	3.0	675	330	52	2.7	8.5
2	1.6	9.6	4.9	4.1	4.3	2.8	3.1	569	320	45	2.7	8.5
3	2.2	10	5.1	4.1	4.4	2.8	3.2	474	283	36	2.7	12
4	1.8	9.6	5.2	4.0	4.5	2.8	3.6	422	237	34	1.9	14
5	2.2	9.3	5.2	4.0	4.5	2.7	4.0	368	220	30	1.6	15
6	2.6	8.0	5.1	4.0	4.6	2.7	4.5	314	207	29	1.5	16
7	7.1	9.0	5.0	4.0	4.6	2.7	5.0	266	180	27	1.4	20
8	8.8	8.5	4.9	3.9	4.6	2.7	6.0	224	167	24	1.2	34
9	12	8.5	4.8	3.9	4.5	2.6	8.0	253	125	22	1.3	31
10	13	8.2	4.7	3.9	4.5	2.6	40	263	92	20	1.2	24
11	15	7.7	4.7	3.9	4.5	2.6	80	289	87	17	.90	18
12	14	7.4	4.7	3.9	4.4	2.6	130	283	84	18	.80	14
13	20	6.9	4.6	3.9	4.3	2.6	150	286	77	19	.80	12
14	21	5.8	4.6	3.9	4.2	2.6	175	283	70	18	.60	11
15	19	5.3	4.6	3.9	4.1	2.5	195	291	76	19	.50	9.9
16	19	5.0	4.6	3.8	3.9	2.5	240	316	148	15	.60	8.8
17	16	4.8	4.5	3.8	3.8	2.5	345	325	270	14	.70	10
18	16	4.7	4.5	3.8	3.7	2.6	453	327	610	12	.50	11
19	16	4.7	4.5	3.8	3.6	2.7	343	268	621	12	.50	12
20	14	4.6	4.5	3.7	3.5	2.8	330	227	488	10	.30	12
21	12	4.6	4.5	3.7	3.4	2.9	284	203	273	9.3	.70	14
22	12	4.7	4.5	3.7	3.3	3.1	185	187	166	7.1	.60	15
23	11	4.8	4.5	3.7	3.2	3.1	199	192	156	4.7	.90	16
24	11	5.0	4.4	3.8	3.1	3.2	248	197	143	2.9	1.4	13
25	12	5.1	4.4	3.8	3.0	3.2	306	221	82	2.6	2.5	10
26	12	5.2	4.4	3.9	3.0	3.3	647	320	32	2.0	2.7	8.2
27	14	5.2	4.3	4.0	2.9	3.2	830	371	41	1.8	2.5	8.5
28	12	4.9	4.3	4.0	2.9	3.2	1,000	407	59	2.0	1.9	7.4
29	12	4.7	4.2	4.1	------	3.1	996	385	66	2.2	1.5	4.9
30	12	4.7	4.2	4.1	------	3.1	855	372	58	2.7	2.8	2.5
31	9.3	------	4.1	4.2	------	3.0	------	327	------	2.5	3.4	------
TOTAL	352.5	196.1	143.3	121.4	109.6	87.6	8,071.4	9,905	5,768	512.8	45.30	401.2
MEAN	11.4	6.54	4.62	3.92	3.91	2.83	269	320	192	16.5	1.46	13.4
MAX	21	10	5.2	4.2	4.6	3.3	1,000	675	621	52	3.4	34
MIN	1.6	4.6	4.1	3.7	2.9	2.5	3.0	187	32	1.8	.30	2.5
CFSM	.10	.060	.042	.036	.036	.026	2.45	2.91	1.75	.15	.013	.12
IN.	.12	.07	.05	.04	.04	.03	2.73	3.35	1.95	.17	.02	.14

CAL YR 1969 TOTAL 17,302.10 MEAN 46.6 MAX 1,100 MIN 1.0 CFSM .42 IN 5.75
WTR YR 1970 TOTAL 25,714.20 MEAN 70.4 MAX 1,000 MIN .30 CFSM .64 IN 8.70

NOTE.--No gage-height record Feb. 8 to Mar. 9.

05140000 Bulldog Run near Warroad, Minn.

LOCATION.--Lat 48°51'30", long 95°20'20", in SE¼ sec.7, T.162 N., R.36 W., Roseau County, near right bank 5 ft downstream from culvert on county highway, 0.8 mile upstream from mouth and 3 miles south of Warroad.

DRAINAGE AREA.--14.2 sq mi.

PERIOD OF RECORD.--March 1946 to November 1951, June 1966 to current year.

GAGE.--Nonrecording gage read once daily. Altitude of gage is 1,090 ft (from topographic map).

AVERAGE DISCHARGE.--9 years (1946-51, 1967-70), 4.10 cfs (3.92 inches per year).

EXTREMES.--Current year: Maximum discharge, 198 cfs Apr. 28 (gage height, 6.20 ft, from graph based on gage readings); maximum gage height, 6.75 ft Apr. 16 (from graph based on gage readings, backwater from ice); no flow for many days.

Period of record: Maximum discharge, 420 cfs June 10, 1947 (gage height, 6.91 ft); maximum gage height, 7.04 ft Apr. 9, 1969 (from floodmark, backwater from ice); no flow for many days in most years.

REMARKS.--Records good.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	0						0	43	104			
2	0						0	33	77			
3	0						0	22	36			
4	0						0	12	23			
5	0						.10	7.5	11			
6	0						.80	4.8	8.4			
7	0						2.5	2.7	6.8			
8	.10						4.0	.70	6.5			
9	.10						3.0	.60	4.4			
10	.20						4.5	10	3.1			
11	.70						7.5	21	.50			
12	.80						18	25	.20			
13	.80						85	21	.20			
14	.70						105	18	.20			
15	.50						95	26	.20			
16	.40						140	46	.20			
17	.20						100	46	13			
18	.10						85	24	61			
19	0						69	9.2	43			
20	0						52	8.4	18			
21	0						20	7.2	6.3			
22	0						10	5.9	1.8			
23	0						23	5.9	.70			
24	0						56	5.3	.60			
25	0						88	6.4	.10			
26	0						80	36	0			
27	0						62	37	0			
28	0						164	26	0			
29	0				------		77	46	0			
30	0				------		50	166	0			
31	0	------			------		------	138	------			------
TOTAL	4.60	0	0	0	0	0	1,401.40	860.60	426.20	0	0	0
MEAN	.15	0	0	0	0	0	46.7	27.8	14.2	0	0	0
MAX	.80	0	0	0	0	0	164	166	104	0	0	0
MIN	0	0	0	0	0	0	0	.60	0	0	0	0
CFSM	.01	0	0	0	0	0	3.29	1.96	1.00	0	0	0
IN.	.01	0	0	0	0	0	3.67	2.25	1.12	0	0	0

CAL YR 1969	TOTAL	771.9	MEAN	2.11	MAX	77	MIN	0	CFSM	.15	IN.	2.02
WTR YR 1970	TOTAL	2,692.8	MEAN	7.38	MAX	166	MIN	0	CFSM	.52	IN.	7.05

05140500 East Branch Warroad River near Warroad, Minn.

LOCATION.--Lat 48°51'30", long 95°18'40", in SE¼SE¼ sec.8, T.162 N., R.36 W., Roseau County, near right bank on piling at upstream side of highway bridge, 2 miles upstream from mouth and 3 miles south of Warroad.

DRAINAGE AREA.--102 sq mi.

PERIOD OF RECORD.--March 1946 to September 1954, June 1966 to current year (fragmentary prior to April 1947).

GAGE.--Nonrecording gage. Altitude of gage is 1,080 ft (from topographic map).

AVERAGE DISCHARGE.--11 years (1947-54, 1967-70), 24.6 cfs (3.28 inches per year).

EXTREMES.--Current year: Maximum discharge, 592 cfs Apr. 28 (gage height, 8.75 ft, from graph based on gage readings); no flow Aug. 12-22, Sept. 1, 2.
Period of record: Maximum discharge, 1,340 cfs June 11, 1947 (gage height, 9.36 ft, from floodmark); no flow at times in most years.

REMARKS.--Records fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.1	21	3.2	3.3	1.6	2.8	5.6	345	176	21	1.1	0
2	2.3	17	3.3	3.3	1.6	2.8	5.7	305	152	16	.80	0
3	4.3	17	3.4	3.2	1.6	2.7	5.9	278	124	13	.30	.10
4	13	15	3.4	3.2	1.6	2.7	6.2	220	100	11	.30	.10
5	14	15	3.5	3.2	1.6	2.7	6.8	202	80	9.5	.20	.40
6	18	14	3.5	3.1	1.7	2.7	8.0	187	65	8.0	.10	8.2
7	16	13	3.5	3.1	1.8	2.6	10	188	57	7.0	.10	16
8	13	13	3.4	3.1	1.8	2.6	15	192	52	6.2	.20	18
9	14	13	3.4	3.0	2.0	2.6	25	188	44	5.7	.20	14
10	35	13	3.4	2.8	2.2	2.6	50	183	39	5.4	.20	7.0
11	36	13	3.3	2.6	2.3	2.6	70	196	22	5.8	.10	4.1
12	40	12	3.3	2.4	2.4	2.6	75	196	16	7.0	0	2.8
13	39	11	3.3	2.2	2.4	2.6	80	195	16	7.5	0	2.1
14	37	10	3.2	2.1	2.5	2.7	95	189	28	7.5	0	1.4
15	36	7.5	3.2	1.9	2.5	2.8	110	188	48	7.2	0	1.2
16	35	5.8	3.2	1.7	2.4	2.9	146	206	60	6.0	0	1.6
17	38	5.0	3.2	1.6	2.4	3.1	168	214	91	5.0	0	1.8
18	39	4.5	3.2	1.5	2.3	3.4	182	200	195	4.3	0	1.7
19	29	4.0	3.1	1.5	2.3	3.8	191	161	284	3.7	0	1.4
20	28	3.7	3.1	1.5	2.4	4.5	167	139	221	3.3	0	.70
21	26	3.6	3.1	1.4	2.4	5.2	151	128	178	2.9	0	.80
22	25	3.6	3.1	1.4	2.5	6.0	131	124	152	2.3	0	.70
23	22	3.7	3.2	1.4	2.6	6.2	122	122	106	.90	.10	1.0
24	18	3.8	3.2	1.4	2.6	6.5	134	108	70	1.1	.30	1.1
25	18	3.9	3.3	1.4	2.7	6.7	192	119	54	1.4	.60	1.1
26	18	3.8	3.3	1.5	2.7	6.8	361	167	47	1.4	2.5	.90
27	17	3.6	3.4	1.5	2.8	6.7	406	207	44	.90	2.1	.90
28	16	3.4	3.4	1.5	2.8	6.4	474	194	42	.70	1.9	.80
29	15	3.3	3.4	1.6	------	6.0	510	193	39	.90	1.7	1.6
30	15	3.2	3.4	1.6	------	5.7	406	194	27	.90	.70	3.0
31	19	------	3.3	1.6	------	5.6	------	189	------	.90	.30	------
TOTAL	697.7	263.4	102.2	66.6	62.5	125.6	4,309.2	5,917	2,629	174.40	13.80	94.50
MEAN	22.5	8.78	3.30	2.15	2.23	4.05	144	191	87.6	5.63	.45	3.15
MAX	40	21	3.5	3.3	2.8	6.8	510	345	284	21	2.5	18
MIN	2.1	3.2	3.1	1.4	1.6	2.6	5.6	108	16	.70	0	0
CFSM	.22	.086	.032	.021	.022	.040	1.41	1.87	.86	.055	.004	.031
IN.	.25	.10	.04	.02	.02	.05	1.57	2.16	.96	.06	.005	.03

CAL YR 1969 TOTAL 9,223.60 MEAN 25.3 MAX 501 MIN .40 CFSM .25 IN 3.36
WTR YR 1970 TOTAL 14,455.90 MEAN 39.6 MAX 510 MIN 0 CFSM .39 IN 5.27

MISSISSIPPI RIVER MAIN STEM

05201000 Winnibigoshish Lake near Deer River, Minn.

LOCATION.--Lat 47°25'42", long 94°03'00", in sec.25, T.146 N., R.27 W., Itasca County, at dam on Mississippi River, 1 mile northwest of Little Winnibigoshish Lake and 14 miles northwest of town of Deer River.

DRAINAGE AREA.--1,442 sq mi.

PERIOD OF RECORD.--April 1884 to current year. Prior to October 1941 monthend contents only, published in WSP 1308. Published as Winnibigoshish Reservoir near Deer River October 1941 to September 1956.

GAGE.--Water-stage recorder. Datum of gage is 1,289.47 ft above mean sea level, adjustment of 1912. Prior to July 8, 1949, nonrecording gage at same site and datum.

EXTREMES.--Current year: Maximum contents, 618,700 acre-ft May 25 (gage height, 10.76 ft); minimum, 485,000 acre-ft Apr. 7 (gage height, 8.02 ft).
Period of record: Maximum contents observed, 996,500 acre-ft July 30, 1905 (gage height, 14.45 ft); minimum observed, 33,680 acre-ft below zero of capacity table Oct. 20, 1931 (gage height, -0.69 ft).

REMARKS.--Reservoir is formed by Winnibigoshish Lake and several other natural lakes controlled by a concrete and timber dam, completed in 1884; storage began in 1884. Capacity between gage heights 6.00 ft and 14.2 ft (maximum allowable range) is 653,570 acre-ft of which 416,270 acre-ft is controlled storage between gage heights 6.00 ft and 12.0 ft (normal operating range). Contents shown herein are contents above gage height 0.00 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records furnished by Corps of Engineers in terms of cfs-days and converted to acre-feet by Geological Survey.

REVISIONS (WATER YEARS).--WSP 1308: 1905(M).

MONTHEND GAGE HEIGHT AND CONTENTS, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Date	Gage height (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept.30	9.75	548,600	-
Oct. 31	10.15	576,000	+27,400
Nov. 30	10.25	583,000	+7,000
Dec. 31	10.17	577,400	-5,600
CAL YR 1969	-	-	+62,900
Jan. 31	9.79	551,200	-26,200
Feb. 28	9.34	521,700	-29,500
Mar. 31	8.92	494,100	-27,600
Apr. 30	9.69	544,700	+50,600
May 31	10.41	594,100	+49,400
June 30	10.14	575,200	-18,900
July 31	9.66	542,700	-32,500
Aug. 31	9.21	513,100	-29,600
Sept.30	8.99	498,700	-14,400
WTR YR 1969	-	-	-49,900

05201500 Mississippi River at Winnibigoshish Dam near Deer River, Minn.

LOCATION.--Lat 47°25'42", long 94°03'00", in SW¼ sec.25, T.146 N., R.27 W., Itasca County, at dam 1 mile northwest of Little Winnibigoshish Lake and 14 miles northwest of town of Deer River.

DRAINAGE AREA.--1,442 sq mi.

PERIOD OF RECORD.--May 1884 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder on headwater and nonrecording gage on tailwater. Tailwater gage read twice daily. Datum of gage is 1,289.47 ft above mean sea level, adjustment of 1912. Prior to July 8, 1949, nonrecording headwater gage at same site and datum.

AVERAGE DISCHARGE (UNADJUSTED).--86 years, 510 cfs (4.80 inches per year).

EXTREMES.--Water year 1969: Maximum daily discharge, 1,220 cfs Nov. 6; minimum daily, 100 cfs Apr. 16-22.
Water year 1970: Maximum daily discharge, 1,290 cfs June 9; minimum daily, 115 cfs Aug. 27 to Sept. 30.
Period of record: Maximum daily discharge, 4,370 cfs Aug. 6, 1905; no flow at times in several years.

REMARKS.--Daily discharge is computed on the basis of modified weir formula and corrected to conform with discharge measurements, the head being determined from readings of headwater and tailwater gages. Flow completely regulated by Winnibigoshish Lake (see preceding page).

COOPERATION.--Computations of daily discharge furnished by Corps of Engineers; four discharge measurements made and records reviewed by Geological Survey.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1968 TO SEPTEMBER 1969

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	315	975	1,180	1,020	1,050	1,060	1,040	103	525	875	880	500
2	315	960	1,180	1,010	1,050	1,060	1,040	103	525	875	880	500
3	315	950	1,180	1,000	1,050	1,060	1,040	103	525	875	880	340
4	315	950	1,180	1,000	1,050	1,060	1,040	103	525	875	880	270
5	315	1,000	1,180	1,000	1,050	1,060	1,040	103	765	875	880	280
6	315	1,220	1,180	1,000	1,050	1,060	1,040	103	785	875	880	280
7	315	1,210	1,180	1,000	1,060	1,060	850	104	785	875	880	280
8	315	1,210	1,180	1,000	1,060	1,060	440	105	785	875	880	280
9	318	1,210	1,180	1,000	1,060	1,060	124	105	780	875	880	280
10	315	1,210	1,180	1,000	1,060	1,060	130	105	795	875	880	280
11	315	1,210	1,180	1,000	1,060	1,060	130	105	795	875	880	280
12	315	1,200	1,180	1,000	1,060	1,060	130	105	900	875	880	280
13	318	1,200	1,180	1,000	1,060	1,060	130	105	900	850	880	280
14	318	1,200	1,150	1,000	1,060	1,060	130	105	900	850	880	260
15	318	1,190	1,140	1,000	1,060	1,060	130	105	900	850	860	260
16	318	1,190	1,130	1,000	1,060	1,060	100	315	900	850	860	260
17	318	1,190	1,000	1,000	1,060	1,060	100	530	875	885	860	260
18	318	1,190	1,020	1,010	1,060	1,060	100	530	875	885	860	260
19	318	1,190	1,020	1,010	1,060	1,060	100	530	875	885	860	260
20	318	1,190	1,020	1,010	1,060	1,060	100	525	875	885	860	260
21	318	1,190	1,020	1,010	1,060	1,060	100	525	875	885	860	260
22	322	1,190	1,030	1,010	1,060	1,060	100	525	875	885	625	260
23	376	1,190	1,030	1,000	1,060	1,060	101	525	875	885	475	265
24	715	1,190	1,030	1,000	1,060	1,060	101	525	875	885	485	260
25	900	1,190	1,020	975	1,060	1,060	101	525	875	880	485	260
26	750	1,190	1,020	965	1,060	1,050	101	525	875	880	485	260
27	740	1,180	1,020	965	1,060	1,050	103	525	875	880	485	260
28	740	1,180	1,020	1,030	1,060	1,050	103	525	875	880	485	260
29	725	1,180	1,020	1,090	------	1,050	103	525	875	880	485	260
30	725	1,180	1,020	1,090	------	1,050	103	525	875	880	500	260
31	725	------	1,020	1,040	------	1,040	------	525	------	880	500	------
TOTAL	13,363	34,705	34,070	31,235	29,620	32,790	9,950	9,767	24,340	27,140	23,350	8,555
MEAN	431	1,157	1,099	1,008	1,058	1,058	332	315	811	875	753	285
MAX	900	1,220	1,180	1,090	1,060	1,060	1,040	530	900	885	880	500
MIN	315	950	1,000	965	1,050	1,040	100	103	525	850	475	260
CFSM	.30	.80	.76	.70	.73	.73	.23	.22	.56	.61	.52	.20
IN.	.34	.90	.88	.81	.76	.85	.26	.25	.63	.70	.60	.22

CAL YR 1968 TOTAL 192,312 MEAN 525 MAX 1,220 MIN 100 CFSM .36 IN 4.96
WTR YR 1969 TOTAL 278,885 MEAN 764 MAX 1,220 MIN 100 CFSM .53 IN 7.19

05201500 Mississippi River at Winnibigoshish Dam near Deer River, Minn.--Continued

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	260	770	850	915	1,060	1,040	1,020	143	1,100	1,280	210	115
2	260	770	850	915	1,060	1,040	1,020	143	1,100	1,280	215	115
3	260	775	850	915	1,060	1,040	1,020	144	1,100	1,280	210	115
4	260	775	920	915	1,060	1,040	1,020	144	1,100	1,280	210	115
5	265	775	915	915	1,060	1,040	1,020	144	1,240	1,270	210	115
6	265	775	915	915	1,050	1,040	1,020	144	1,240	1,260	210	115
7	350	775	915	915	1,050	1,040	1,020	145	1,240	1,240	210	115
8	350	775	915	915	1,050	1,040	1,020	145	1,230	900	210	115
9	430	775	920	915	1,050	1,040	740	145	1,290	690	210	115
10	435	775	920	915	1,050	1,040	540	145	1,280	695	210	115
11	430	780	920	910	1,050	1,040	320	145	1,280	700	210	115
12	430	780	915	910	1,050	1,040	132	146	1,280	705	210	115
13	430	860	915	910	1,050	1,040	134	440	1,280	710	210	115
14	680	855	920	910	1,050	1,040	136	615	1,280	560	210	115
15	670	855	920	910	1,050	1,040	137	640	1,280	565	145	115
16	790	850	915	1,010	1,040	1,030	138	1,000	1,280	565	145	115
17	785	850	915	1,010	1,040	1,030	138	975	1,280	565	145	115
18	780	855	915	1,000	1,040	1,030	139	970	1,280	490	145	115
19	775	850	915	1,000	1,040	1,030	139	1,100	1,280	495	145	115
20	775	840	915	1,000	1,040	1,030	140	1,120	1,270	495	145	115
21	770	840	915	1,070	1,040	1,030	140	1,120	1,270	195	145	115
22	775	840	915	1,060	1,040	1,020	140	1,110	1,260	200	145	115
23	770	835	915	1,060	1,040	1,020	140	1,100	1,260	200	145	115
24	770	840	915	1,060	1,040	1,020	141	1,100	1,260	205	145	115
25	770	845	915	1,060	1,040	1,020	141	1,090	1,260	205	145	115
26	775	845	915	1,060	1,040	1,020	141	1,110	1,260	205	140	115
27	775	850	915	1,060	1,040	1,020	141	1,100	1,260	205	115	115
28	770	850	915	1,060	1,040	1,020	142	1,100	1,250	210	115	115
29	770	850	915	1,060	------	1,020	142	1,100	1,250	210	115	115
30	770	850	915	1,060	------	1,020	142	1,100	1,240	210	115	115
31	770	------	915	1,060	------	1,020	------	1,100	------	210	115	------
TOTAL	18,165	24,560	28,200	30,390	29,320	31,980	12,403	20,723	37,280	19,280	5,255	3,450
MEAN	586	819	910	980	1,047	1,032	413	668	1,243	622	170	115
MAX	790	860	920	1,070	1,060	1,040	1,020	1,120	1,290	1,280	215	115
MIN	260	770	850	910	1,040	1,020	132	143	1,100	195	115	115
CFSM	.41	.57	.63	.68	.73	.72	.29	.46	.86	.43	.12	.08
IN.	.47	.63	.73	.78	.76	.83	.32	.53	.96	.50	.14	.09

CAL YR 1969 TOTAL 267,672 MEAN 733 MAX 1,090 MIN 100 CFSM .51 IN 6.91
WTR YR 1970 TOTAL 261,006 MEAN 715 MAX 1,290 MIN 115 CFSM .50 IN 6.73

05206000 Leech Lake at Federal Dam, Minn.

LOCATION.--Lat 47°12'23", long 94°18'31", in lot 2, sec.14, T.143 N., R.29 W., Cass County, at head of Leech Lake River on Waboose Bay, 5 miles southwest of town of Federal Dam.

DRAINAGE AREA.--1,163 sq mi.

PERIOD OF RECORD.--April 1884 to current year. Monthend contents only ~~for some periods~~, published in WSP 1308. Prior to October 1956, published as "Leech Lake Reservoir".

GAGE.--Water-stage recorder. Datum of gage is 1,293.23 ft above mean sea level, adjustment of 1912. Prior to Dec. 31, 1884, nonrecording gage 0.5 mile north of outlet to Leech Lake River at datum 5.76 ft lower. Dec. 31, 1884, to May 24, 1931, nonrecording gage half a mile north of outlet to Leech Lake River at present datum.

EXTREMES.--Current year: Maximum contents, 281,300 acre-ft June 19 (gage height, 1.98 ft); minimum, 130,000 acre-ft Apr. 9 (gage height, 0.71 ft).
Period of record: Maximum contents observed, 734,300 acre-ft June 30, 1916 (gage height, 5.18 ft); minimum observed, 72,830 acre-ft below zero of capacity table Sept. 30, Nov. 19, 1934, Jan. 9, 1935 (gage height, -1.18 ft).

REMARKS.--Reservoir is formed by Leech Lake and several other natural lakes controlled by concrete and timber dam; storage began in 1884; original timber structure completed in 1884, replaced by present dam in 1902. Capacity between gage heights 0.00 ft and 5.24 ft (maximum allowable range) is 689,780 acre-ft, of which 356,570 acre-ft is controlled storage between gage heights 0.00 and 3.00 ft (normal operating range). Contents shown herein are contents above gage height -0.50 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records furnished by Corps of Engineers in terms of cfs-days and converted to acre-feet by Geological Survey.

MONTHEND GAGE HEIGHT AND CONTENTS, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Date	Gage height (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept.30	1.28	192,700	-
Oct. 31	1.50	220,600	+27,900
Nov. 30	1.08	170,200	-50,400
Dec. 31	1.23	186,500	+16,300
CAL YR 1969	-	-	-11,200
Jan. 31	1.01	162,600	-23,900
Feb. 28	.86	146,300	-16,300
Mar. 31	.76	135,400	-10,900
Apr. 30	1.50	220,600	+85,200
May 31	1.83	262,200	+41,600
June 30	1.86	266,000	+3,800
July 31	1.46	215,400	-50,600
Aug. 31	1.00	161,500	-53,900
Sept.30	.78	137,600	-23,900
WTR YR 1970	-	-	-55,100

05206500 Leech Lake River at Federal Dam, Minn.

LOCATION.--Lat 47°14'45", long 94°13'12", in sec.29, T.144 N., R.28 W., Cass County, on right bank at dam on Leech Lake River at town of Federal Dam, 2 miles downstream from natural outlet of Leech Lake.

DRAINAGE AREA.--1,163 sq mi.

PERIOD OF RECORD.--May 1884 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder, headwater gage, and nonrecording tailwater gage. Datum of gage is 1,293.23 ft above mean sea level, adjustment of 1912. Prior to July 3, 1948, nonrecording headwater gage at same datum. May 27 to Nov. 30, 1929, nonrecording gage at site 600 ft downstream at different datum.

AVERAGE DISCHARGE.--86 years, 349 cfs, unadjusted (4.08 inches per year).

EXTREMES.--Current year: Maximum daily discharge, 898 cfs Dec. 9-11, 13, 14, 19; minimum daily, 52 cfs July 14, 15.
Period of record: Maximum daily discharge, 2,520 cfs June 7, 1957 (result of dam failure); no flow at times.

REMARKS.--Discharge computed on basis of modified weir formula, the head being obtained from readings on tailwater gage and mean gage height from recording headwater gage. Flow completely regulated by Leech Lake (see preceding page).

COOPERATION.--Computations of daily discharge furnished by Corps of Engineers; nine discharge measurements made and records reviewed by Geological Survey.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	245	658	796	870	750	700	675	100	441	515	102	73
2	251	658	812	870	712	675	675	100	441	520	102	73
3	234	662	807	870	650	675	675	100	441	520	100	73
4	245	670	843	870	662	675	675	100	441	515	100	73
5	297	658	832	826	700	675	675	100	525	515	100	73
6	326	654	870	879	425	675	675	100	525	515	100	73
7	363	654	875	874	665	675	675	100	525	260	100	73
8	381	650	892	868	665	675	690	100	525	156	100	73
9	387	654	898	868	665	675	710	100	525	104	100	73
10	416	658	898	847	860	675	96	100	525	104	100	73
11	358	678	898	858	650	675	96	100	520	104	75	73
12	358	685	892	858	675	675	96	100	515	104	75	72
13	376	690	898	841	635	675	96	104	515	104	75	72
14	414	623	898	856	590	675	96	104	520	52	75	72
15	403	604	886	775	615	675	96	104	525	52	75	72
16	398	608	881	770	650	675	96	234	525	104	75	73
17	405	616	881	760	660	675	96	390	530	104	75	72
18	544	608	892	746	650	675	96	390	515	102	75	95
19	529	714	898	736	625	675	96	440	525	102	75	95
20	535	699	870	653	625	350	96	440	520	102	75	94
21	640	699	870	647	650	675	100	430	520	102	75	96
22	648	709	859	643	675	675	100	430	520	102	75	96
23	632	709	848	647	675	675	100	437	520	102	75	95
24	648	728	827	651	675	675	100	437	520	102	73	95
25	639	786	880	660	650	675	100	444	515	102	73	95
26	670	786	886	664	638	675	100	444	515	100	73	95
27	690	786	875	645	670	675	100	437	515	100	73	95
28	662	786	870	660	675	675	100	437	515	100	73	95
29	641	791	880	668	------	675	100	437	515	100	73	95
30	639	796	875	712	------	675	100	441	515	100	73	95
31	639	------	870	735	------	675	------	441	------	102	73	------
TOTAL	14,613	20,677	26,957	23,827	18,437	20,625	8,181	8,221	15,294	5,766	2,563	2,472
MEAN	471	689	870	769	658	665	273	265	510	186	82.7	82.4
MAX	690	796	898	879	860	700	710	444	530	520	102	96
MIN	234	604	796	643	425	350	96	100	441	52	73	72
CFSM	.41	.59	.75	.66	.57	.57	.23	.23	.44	.16	.07	.07
IN.	.47	.66	.86	.76	.59	.66	.26	.26	.49	.18	.08	.08

CAL YR 1969 TOTAL 219,357 MEAN 601 MAX 961 MIN 92 CFSM .52 IN 7.02
WTR YR 1970 TOTAL 167,633 MEAN 459 MAX 898 MIN 52 CFSM .39 IN 5.36

- 27770
139863 365 383

05210500 Pokegama Lake near Grand Rapids, Minn.

LOCATION.--Lat 47°10'00", long 93°33'20", in NW¼ sec.17, T.54 N., R.25 W., Itasca County, at narrows on U.S. Highway 169, 4 miles south of Grand Rapids.

DRAINAGE AREA.--3,265 sq mi.

PERIOD OF RECORD.--April 1884 to current year. Prior to October 1941 monthend contents only, published in WSP 1308. Published as Pokegama Reservoir near Grand Rapids October 1941 to September 1956.

GAGE.--Water-stage recorder. Datum of gage is 1,264.89 ft above mean sea level, adjustment of 1912. Prior to May 30, 1949, nonrecording gage at Pooles Arm of Pokegama Lake, 5 miles northwest at same datum.

EXTREMES.--Current year: Maximum contents, 65,970 acre-ft May 5, 6 (gage height, 962 ft(; minimum, 33,480 acre-ft Feb. 27 (gage height, 7.20 ft).
Period of record: Maximum contents, 121,400 acre-ft May 8, 1897 (gage height, 13.50 ft); minimum observed, 4,520 acre-ft below zero of capacity table Sept. 30, 1934 (gage height, 4.12 ft).

REMARKS.--Reservoir is formed by Pokegama Lake and several other natural lakes controlled by concrete dam; storage began in 1884; original timber dam completed in 1884, replaced by present structure in 1888-89. Capacity between gage heights 6.00 ft and 12.0 ft (maximum allowable range) is 81,720 acre-ft, of which 53,150 acre-ft is controlled storage between gage heights 6.00 ft and 10.00 ft (normal operating range). Contents shown herein are contents above gage height 4.50 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records furnished by Corps of Engineers in terms of cfs-days and converted to acre-feet by Geological survey.

MONTHEND GAGE HEIGHT AND CONTENTS, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Date	Gage height (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept.30	8.65	52,360	-
Oct. 31	8.65	52,360	0
Nov. 30	7.75	40,560	-11,800
Dec. 31	7.60	38,600	-1,960
CAL YR 1969	-	-	+720
Jan. 31	7.56	38,080	-520
Feb. 28	7.20	33,480	-4,600
Mar. 31	7.92	50,720	+17.240
Apr. 30	9.16	59,410	+8,690
May 31	9.26	60,830	+1,420
June 30	8.95	56,450	-4,380
July 31	8.97	56,730	+280
Aug. 31	8.36	48,560	-8,170
Sept.30	7.77	40,820	-7,740
WTR YR 1970	-	-	-11,540

05211000 Mississippi River at Grand Rapids, Minn.

LOCATION.--Lat 47°13'56", long 93°31'48", in SW¼NW¼ sec.21, T.55 N., R.25 W., Itasca County, in super-calendar room of Blandin Paper Mill in Grand Rapids, 400 ft upstream from bridge on U.S. Highway 169, 2.5 miles upstream from Prairie River, and at mile 1,182 upstream from Ohio River.

DRAINAGE AREA.--3,370 sq mi, approximately.

PERIOD OF RECORD.--October 1883 to current year. Monthly discharge only for ~~some periods~~, published in WSP 1308. Published as "at Pokegama Dam near Grand Rapids" 1942-44.

GAGE.--Water-stage recorder. Datum of gage is 1,242.00 ft above mean sea level, adjustment of 1912. See WSP 1728 for history of changes prior to Jan. 17, 1951.

AVERAGE DISCHARGE.--87 years, 1,140 cfs.

EXTREMES.--Current year: Maximum discharge, 3,120 cfs June 14 (gage height, 8.18 ft); maximum gage height, 9.01 ft May 4 (backwater from Prairie River); minimum discharge, 165 cfs Sept. 15 (gage height, 2.64 ft), result of regulation.

Period of record: Maximum discharge, 12,500 cfs Sept. 3, 1948 (gage height, 15.2 ft, from floodmark), caused by dam failure at gage, from rating curve extended above 4,500 cfs by logarithmic plotting; maximum daily, 5,250 cfs Sept. 5, 8, 1905; no flow at times in several years.

REMARKS.--Records good except those for winter months, which are fair. Flow completely regulated by Pokegama Lake (see preceding page). Backwater from Prairie River occurs at times in most years.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	983	1,820	1,760	1,900	1,900	1,910	2,310	2,100	2,150	2,240	461	298
2	965	1,780	1,750	1,970	1,890	1,920	2,310	2,110	2,320	2,240	537	291
3	993	1,850	1,790	1,900	1,870	1,940	2,290	2,130	2,380	2,260	436	288
4	985	2,040	1,830	1,900	1,860	1,950	2,280	2,130	2,360	2,250	350	286
5	1,010	2,010	1,830	1,890	1,870	1,950	2,300	2,120	2,350	2,200	343	301
6	1,020	1,990	1,820	1,900	1,860	1,940	2,260	2,120	2,340	1,930	375	308
7	1,110	1,970	1,840	1,890	1,870	1,950	2,260	2,100	2,370	1,530	379	320
8	1,100	2,000	1,850	1,880	1,880	1,960	2,300	2,080	2,360	1,210	374	346
9	1,290	2,050	1,960	1,880	1,860	1,960	2,390	1,800	2,350	1,240	373	277
10	1,240	1,930	2,010	1,870	1,840	1,970	2,470	1,720	2,450	1,250	364	276
11	1,310	1,980	1,970	1,870	1,850	1,970	2,410	1,710	2,610	1,260	369	289
12	1,270	1,970	1,990	1,860	1,850	1,960	2,050	1,700	3,020	1,240	371	302
13	1,290	1,920	1,970	1,850	1,860	1,980	1,800	1,690	2,980	1,360	362	293
14	1,280	1,970	1,980	1,860	1,860	1,970	1,770	1,700	3,070	1,210	354	282
15	1,270	1,950	1,960	1,870	1,860	1,980	1,790	1,720	2,960	1,270	362	269
16	1,550	1,880	1,950	1,870	1,850	1,920	1,800	1,730	2,480	1,240	365	267
17	1,550	1,860	1,940	1,870	1,850	1,980	1,800	1,720	2,460	1,360	358	256
18	1,550	1,830	1,930	1,880	1,860	1,990	1,800	1,710	2,400	1,380	346	249
19	1,500	1,750	1,940	1,890	1,860	1,980	1,810	1,690	2,280	1,320	335	238
20	1,570	1,780	1,950	1,900	1,870	2,030	1,830	1,680	2,420	1,330	330	254
21	1,530	1,780	1,940	1,890	1,870	2,000	1,880	1,690	2,520	1,090	335	271
22	1,520	1,760	1,940	1,880	1,860	2,110	1,850	1,700	2,470	851	333	267
23	1,550	1,780	1,930	1,880	1,860	2,110	1,800	1,720	2,530	933	333	253
24	1,610	1,730	1,930	1,900	1,870	2,200	1,700	1,800	2,420	911	338	260
25	1,790	1,730	1,930	1,900	1,880	2,160	1,320	1,870	2,310	663	328	262
26	1,760	1,750	1,920	1,900	1,890	2,360	1,340	1,950	2,430	684	333	265
27	1,780	1,810	1,910	1,890	1,900	2,310	1,380	2,000	2,320	612	340	260
28	1,730	1,710	1,910	1,970	1,900	2,270	1,470	2,050	2,250	584	309	254
29	1,760	1,770	1,900	1,950	------	2,320	1,860	2,100	2,250	575	310	258
30	1,760	1,750	1,900	1,930	------	2,320	2,090	2,110	2,230	503	309	269
31	1,770	------	1,890	1,920	------	2,320	------	2,120	------	511	304	------
TOTAL	43,496	55,900	59,120	58,710	52,300	63,690	58,720	58,570	73,840	39,237	11,116	8,309
MEAN	1,403	1,863	1,907	1,894	1,868	2,055	1,957	1,889	2,461	1,266	359	277
MAX	1,790	2,050	2,010	1,970	1,900	2,360	2,470	2,130	3,070	2,260	537	346
MIN	965	1,710	1,750	1,850	1,840	1,910	1,320	1,680	2,150	503	304	238

CAL YR 1969 TOTAL 672,260 MEAN 1,842 MAX 4,610 MIN 627
WTR YR 1970 TOTAL 583,008 MEAN 1,597 MAX 3,070 MIN 238

05212700 Prairie River near Taconite, Minn.

LOCATION.--Lat 47°23'20", long 93°22'50", in NW¼SW¼ sec.27, T.57 N., R.24 W., Itasca County, on left bank 125 ft upstream from highway bridge, 1.5 miles downstream from outlet of Lawrence Lake and 5 miles north of Taconite.

DRAINAGE AREA.--360 sq mi, approximately.

PERIOD OF RECORD.--April 1967 to current year.

GAGE.--Water-stage recorder. Prior to Aug. 31, 1967, nonrecording gage at site 125 ft downstream at same datum.

EXTREMES.--Current year: Maximum discharge, 1,990 cfs May 2 (gage height, 10.12 ft); minimum daily, 18 cfs Aug. 27, 28, Sept. 1, 2; minimum gage height, 1.86 ft Sept. 14, 15.
Period of record: Maximum discharge, 3,260 cfs Apr. 17, 1969 (gage height, 11.81 ft); minimum daily, 18 cfs Aug. 27, 28, Sept. 1, 2, 1970; minimum gage height, 1.86 ft Sept. 14, 15, 1970.

REMARKS.--Records good except those for period of no gage-height record and those for winter months, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	141	175	143	91	70	69	85	1,950	580	225	60	18
2	143	183	137	89	70	70	80	1,970	612	204	55	18
3	144	193	137	88	68	72	75	1,880	635	191	47	20
4	146	206	139	86	67	74	70	1,690	650	180	43	20
5	159	216	141	84	67	77	65	1,490	640	163	40	20
6	161	227	141	83	66	80	60	1,290	625	156	38	19
7	165	234	141	81	66	83	80	1,140	605	151	36	19
8	173	238	140	79	66	86	125	1,050	582	155	34	20
9	176	239	139	78	67	90	150	1,000	542	145	32	20
10	186	241	138	76	68	93	184	949	506	138	32	22
11	195	239	136	74	69	97	225	899	538	132	31	21
12	195	237	133	72	69	102	290	853	578	122	30	20
13	196	232	131	71	69	104	347	809	584	115	30	20
14	196	223	129	70	67	107	394	762	586	115	29	20
15	196	214	127	68	66	109	458	720	592	120	28	20
16	198	203	124	68	65	112	516	692	604	125	28	22
17	196	193	122	67	64	114	562	654	616	130	25	23
18	193	184	119	66	64	117	592	624	604	130	22	24
19	190	176	116	66	64	118	624	594	578	126	22	24
20	189	170	114	65	65	118	644	558	550	122	21	24
21	184	168	112	65	65	117	652	548	514	115	20	31
22	178	166	110	65	65	117	646	534	477	100	20	29
23	178	163	108	65	65	116	640	514	438	92	20	28
24	168	162	106	66	67	113	654	504	402	85	19	26
25	169	163	104	66	69	112	742	500	368	80	19	25
26	173	165	103	66	69	108	849	502	344	78	19	26
27	169	168	101	67	69	106	943	502	317	75	18	24
28	165	166	99	68	69	101	1,050	502	292	72	18	23
29	165	164	96	69	------	98	1,320	502	269	70	19	21
30	165	154	94	70	------	94	1,720	532	244	66	19	19
31	169	------	92	70	------	90	------	544	------	64	19	------
TOTAL	5,421	5,862	3,772	2,259	1,875	3,064	14,842	27,258	15,472	3,842	893	666
MEAN	175	195	122	72.9	67.0	98.8	495	879	516	124	28.8	22.2
MAX	198	241	143	91	70	118	1,720	1,970	650	225	60	31
MIN	141	154	92	65	64	69	60	500	244	64	18	18
CFSM	.49	.54	.34	.20	.19	.27	1.38	2.44	1.43	.34	.08	.06
IN.	.56	.61	.39	.23	.19	.32	1.53	2.82	1.60	.40	.09	.07

CAL YR 1969 TOTAL 102,596 MEAN 281 MAX 3,240 MIN 67 CFSM .78 IN 10.60
WTR YR 1970 TOTAL 85,226 MEAN 233 MAX 1,970 MIN 18 CFSM .65 IN 8.81

NOTE.--No gage-height record July 11 to Aug. 12.

05216860 Swan River near Calumet, Minn.

LOCATION.--Lat 47°17'20", long 93°13'54", in SW¼ sec.35, T.56 N., R.23 W., Itasca County, on left bank 1.0 mile downstream from Snowball Creek, 2.1 miles downstream from bridge on U.S. Highway 65 at outlet of Swan Lake and 3.1 miles southeast of Calumet.

PERIOD OF RECORD.--January 1964 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,331.19 ft above mean sea level, datum of 1929. Prior to June 5, 1964, reference point at same site and datum.

AVERAGE DISCHARGE.--6 years, 61.6 cfs.

EXTREMES.--Current year: Maximum discharge, 510 cfs Apr. 29 (gage height, 5.58 ft); minimum daily, 2.0 cfs Sept. 13, 14.
Period of record: Maximum discharge, 773 cfs Apr. 15, 1969 (gage height, 5.83 ft); minimum daily, 2.0 cfs Sept. 13, 14, 1970.

REMARKS.--Records good. Flow affected by natural storage in Swan Lake.

COOPERATION.--Additional discharge measurements and gage readings furnished by M. A. Hanna Mining Company.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	31	31	24	31	20	22	26	442	91	36	10	2.6
2	31	34	22	31	20	24	22	400	94	29	8.8	2.9
3	36	34	22	29	18	26	22	354	98	26	7.7	2.6
4	34	31	20	29	18	31	20	317	94	24	7.2	2.9
5	34	34	22	26	18	31	20	281	91	22	7.2	2.9
6	31	34	24	26	20	34	22	242	79	20	7.2	2.9
7	29	34	31	26	22	34	22	220	76	20	7.2	2.9
8	29	34	38	24	22	34	31	200	65	22	6.7	2.9
9	31	34	41	22	22	34	45	179	59	24	6.2	2.6
10	29	34	41	22	22	34	62	160	59	24	6.7	2.6
11	29	31	38	22	22	34	76	146	81	22	8.2	2.9
12	29	29	36	22	22	31	87	128	87	20	7.7	2.2
13	26	26	36	20	22	31	98	120	87	18	8.8	2.0
14	22	31	36	20	22	31	102	109	84	18	8.2	2.0
15	24	31	34	20	22	31	113	106	84	22	7.2	2.2
16	22	34	34	20	22	31	117	102	84	20	6.2	2.2
17	22	34	31	20	22	34	124	102	79	18	6.7	2.2
18	22	34	31	18	22	34	133	98	76	24	6.2	2.2
19	22	31	31	18	24	36	142	94	73	36	5.8	2.2
20	21	29	31	16	24	34	151	94	67	31	4.9	2.9
21	21	29	31	18	24	34	142	94	59	29	4.9	3.7
22	20	26	31	18	24	34	138	91	59	26	4.1	2.9
23	20	26	29	18	24	34	138	91	52	24	3.7	4.1
24	21	26	29	18	24	34	133	91	50	18	3.7	4.1
25	22	29	29	16	24	31	146	79	48	18	3.7	3.8
26	24	29	29	18	22	31	205	76	48	15	3.7	3.5
27	22	29	29	20	22	29	317	79	45	15	2.9	3.5
28	24	26	29	20	22	29	435	73	45	15	2.9	3.6
29	24	24	31	20	------	26	502	70	38	14	2.9	3.4
30	26	24	29	18	------	26	478	79	41	12	2.6	3.9
31	29	------	29	18	------	26	------	81	------	12	2.2	------
TOTAL	807	912	948	664	612	965	4,069	4,798	2,093	674	182.1	87.3
MEAN	26.0	30.4	30.6	21.4	21.9	31.1	136	155	69.8	21.7	5.87	2.91
MAX	36	34	41	31	24	36	502	442	98	36	10	4.1
MIN	20	24	20	16	18	22	20	70	38	12	2.2	2.0

CAL YR 1969 TOTAL 22,955.4 MEAN 62.9 MAX 730 MIN 6.7
WTR YR 1970 TOTAL 16,811.4 MEAN 46.1 MAX 502 MIN 2.0

05218500 Sandy Lake at Libby, Minn.

LOCATION.--Lat 46°47'20, long 93°19'10", in sec.25, T.50 N., R.24 W., Aitkin County, on dam on Sandy River at Libby, 1.2 miles above mouth, and 14 miles north of McGregor.

DRAINAGE AREA.--421 sq mi.

PERIOD OF RECORD.--July to December 1893, October to December 1894, July 1895 to current year. Monthend contents only ~~for some periods~~, published in WSP 1308. Published as Sandy Lake Reservoir at Libby October 1941 to September 1956.

GAGE.--Water-stage recorder. Datum of gage is 1,207.71 ft above mean sea level, adjustment of 1912. Prior to Sept. 23, 1949, nonrecording gage at ~~same site and datum~~.

EXTREMES.--Current year: Maximum contents, 63,100 acre-ft May 7, 8, 9 (gage height, 10.09 ft); minimum, 29,420 acre-ft Apr. 4, 5 (gage height, 6.30 ft).
Period of record: Maximum contents, 167,200 acre-ft May 19, 1950 (gage height, 17.51 ft); minimum observed, 5,950 acre-ft below zero of capacity table Jan. 20, 1921 (gage height, 0.65 ft).

REMARKS.--Reservoir is formed by Sandy, Flowage, Snake, and Aitkin Lakes controlled by concrete dam. Storage began in 1893; original timber crib dam completed in 1895, replaced by present structure in 1911. Capacity between gage heights 7.00 ft and 14.00 ft (minimum allowable limit to top of structure) is 73,330 acre-ft, of which 37,550 acre-ft is controlled storage between gage heights 7.00 ft and 11.00 ft (normal operating range). Contents shown herein are contents above gage height 1.72 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records furnished by Corps of Engineers in terms of cfs-days and converted to acre-feet by Geological Survey.

MONTHEND GAGE HEIGHT AND CONTENTS, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Date	Gage height (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept.30	8.92	51,770	-
Oct. 31	8.69	49,630	-2,140
Nov. 30	8.32	46,280	-3,350
Dec. 31	7.79	41,610	-4,670
CAL YR 1969	-	-	-2,820
Jan. 31	7.17	36,360	-5,250
Feb. 28	6.62	31,910	-4,450
Mar. 31	6.33	29,650	-2,260
Apr. 30	9.61	58,350	+28,700
May 31	9.11	53,550	-4,800
June 30	8.99	52,400	-1,150
July 31	8.79	50,560	-1,840
Aug. 31	8.41	47,090	-3,470
Sept.30	8.25	45,660	-1,430
WTR YR 1970	-	-	-6,110

05219000 Sandy River at Sandy Lake Dam, at Libby, Minn.

LOCATION.--Lat 46°47'20", long 93°19'10", in sec.25, T.50 N., R.24 W., Aitkin County, on dam on Sandy River at Libby, 1.2 miles above mouth, and 14 miles north of McGregor.

DRAINAGE AREA.--421 sq mi.

PERIOD OF RECORD.--July 1893 to March 1894, July 1894, November 1894 to March 1895, August 1895 to current year. Monthly discharge only for some periods, published in WSP 1308. Published as "below Sandy Lake Reservoir" 1893-1916.

GAGE.--Water-stage recorders on headwater and tailwater. Datum of gages is 1,207.71 ft above mean sea level, adjustment of 1912. Prior to June 20, 1949, nonrecording gages at same site and datum.

AVERAGE DISCHARGE (UNADJUSTED).--75 years (1895-1970), 207 cfs (6.68 inches per year).

EXTREMES.--Current year: Maximum daily discharge, 1,460 cfs May 15; minimum daily, 10 cfs Oct. 1-6, July 2 to Sept. 30.
Period of record: Maximum daily discharge, 3,740 cfs July 12, 1897; no flow at times.

REMARKS.--Discharge computed on basis of head over dam, using modified weir formula, head being obtained from headwater and tailwater recorder records. Flow completely regulated by Sandy Lake (see preceding page).

COOPERATION.--Two discharge measurements made and records reviewed by Geological Survey. Computations of daily discharge furnished by Corps of Engineers.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	92	140	114	100	96	62	1,020	290	39	10	10
2	10	92	138	114	100	94	62	925	290	10	10	10
3	10	92	136	114	102	92	62	960	445	10	10	10
4	10	92	136	114	104	90	62	825	435	10	10	10
5	10	90	138	114	106	90	62	770	430	10	10	10
6	10	88	140	114	104	90	60	770	425	10	10	10
7	54	88	136	114	104	90	58	750	430	10	10	10
8	53	108	134	116	100	88	62	750	430	10	10	10
9	52	108	134	116	100	88	68	800	430	10	10	10
10	52	106	134	116	98	86	80	895	145	10	10	10
11	52	106	132	116	98	86	86	1,020	155	10	10	10
12	52	106	132	116	98	84	86	1,160	10	10	10	10
13	51	106	130	116	98	82	96	1,280	10	10	10	10
14	102	106	128	114	100	82	106	1,360	10	10	10	10
15	102	108	128	114	102	82	110	1,460	10	10	10	10
16	104	108	130	114	102	82	110	1,000	10	10	10	10
17	100	108	132	114	100	82	110	1,050	10	10	10	10
18	100	108	132	114	100	82	108	737	10	10	10	10
19	98	152	132	114	100	80	442	270	122	10	10	10
20	98	146	125	114	98	78	1,000	275	126	10	10	10
21	98	146	122	114	98	78	940	295	128	10	10	10
22	98	144	120	114	98	78	905	300	128	10	10	10
23	98	142	118	114	96	78	870	305	128	10	10	10
24	98	142	116	112	94	76	825	310	126	10	10	10
25	98	140	114	110	94	72	800	310	126	10	10	10
26	96	138	114	110	96	66	960	305	128	10	10	10
27	94	136	112	108	96	64	1,010	305	128	10	10	10
28	94	136	114	106	96	60	1,000	305	130	10	10	10
29	94	140	114	104	------	62	1,000	305	128	10	10	10
30	94	140	114	102	------	70	1,040	300	64	10	10	10
31	94	------	114	100	------	68	------	295	------	10	10	------
TOTAL	2,186	3,514	3,939	3,486	2,782	2,496	12,242	21,412	5,437	339	310	300
MEAN	70.5	117	127	112	99.4	80.5	408	691	181	10.9	10.0	10.0
MAX	104	152	140	116	106	96	1,040	1,460	445	39	10	10
MIN	10	88	112	100	94	60	58	270	10	10	10	10
CFSM	.17	.28	.30	.27	.24	.19	.97	1.64	.43	.03	.02	.02
IN.	.19	.31	.35	.31	.25	.22	1.08	1.89	.48	.03	.03	.03

CAL YR 1969 TOTAL 85,861.00 MEAN 235 MAX 1,940 MIN 0 CFSM .56 IN 7.59
WTR YR 1970 TOTAL 58,443.00 MEAN 160 MAX 1,460 MIN 10 CFSM .38 IN 5.16

05220500 Mississippi River below Sandy River, near Libby, Minn.

LOCATION.--Lat 46°47'23", long 93°19'43", in SE¼NE¼ sec.25, T.50 N., R.24 W., Aitkin County, on right bank 600 ft downstream from Sandy River, 0.8 mile northwest of Libby, and at mile 1,106 upstream from Ohio River.

DRAINAGE AREA.--5,060 sq mi, approximately.

PERIOD OF RECORD.--April 1930 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,204.55 ft above mean sea level, adjustment of 1912. Prior to July 28, 1931, nonrecording gage at site 600 ft upstream at datum 3.16 ft higher.

AVERAGE DISCHARGE.--40 years, 1,946 cfs (5.22 inches per year).

EXTREMES.--Current year: Maximum discharge, 6,140 cfs May 7 (gage height, 12.80 ft); minimum daily, 370 cfs Sept. 29, 30.
Period of record: Maximum discharge, 16,000 cfs May 17, 1950 (gage height, 20.02 ft); minimum, 83 cfs Nov. 16, 1936 (gage height, 1.44 ft).

REMARKS.--Records good except those for winter months, which are fair. Flow regulated by powerplants and Winnibigoshish, Leech, Pokegama, and Sandy Lakes (see p. 101, 104, 106, 110).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1,230	2,160	2,100	2,000	1,900	2,120	2,610	5,700	3,540	2,550	709	395
2	1,250	2,210	2,070	2,000	1,910	2,130	2,620	5,810	3,570	2,470	722	385
3	1,250	2,240	2,020	1,990	1,910	2,140	2,700	5,910	3,650	2,480	714	380
4	1,260	2,250	2,000	1,990	1,920	2,160	2,850	5,980	3,690	2,480	700	380
5	1,280	2,310	2,000	1,960	1,930	2,180	3,000	6,060	3,740	2,490	594	385
6	1,330	2,390	2,020	1,940	1,930	2,190	3,120	6,100	3,730	2,500	542	390
7	1,500	2,410	2,070	1,930	1,940	2,200	3,250	6,130	3,700	2,420	516	385
8	1,480	2,420	2,120	1,920	1,960	2,200	3,400	6,120	3,670	2,130	533	380
9	1,530	2,420	2,180	1,910	1,970	2,210	3,500	6,070	3,590	1,740	533	390
10	1,580	2,450	2,210	1,910	1,980	2,220	3,420	5,970	3,330	1,520	529	400
11	1,610	2,440	2,230	1,910	1,980	2,230	3,400	5,820	3,170	1,480	533	455
12	1,610	2,410	2,240	1,900	1,980	2,250	3,440	5,610	3,060	1,480	533	420
13	1,640	2,410	2,260	1,900	1,990	2,260	3,410	5,400	3,110	1,490	559	405
14	1,680	2,380	2,270	1,900	1,990	2,260	3,330	5,180	3,300	1,500	551	425
15	1,690	2,270	2,270	1,900	1,990	2,250	3,390	4,940	3,470	1,500	551	475
16	1,690	2,150	2,270	1,890	2,000	2,240	3,520	4,570	3,560	1,440	542	465
17	1,750	2,020	2,260	1,890	2,000	2,260	3,640	4,430	3,580	1,470	538	450
18	1,840	1,910	2,240	1,880	2,010	2,280	3,640	4,100	3,460	1,460	529	440
19	1,890	1,930	2,200	1,870	2,020	2,300	3,850	3,660	3,340	1,540	533	415
20	1,890	1,980	2,180	1,870	2,030	2,330	4,290	3,460	3,180	1,640	495	390
21	1,880	2,060	2,160	1,870	2,030	2,350	4,320	3,340	3,060	1,720	478	395
22	1,890	2,150	2,150	1,870	2,040	2,390	4,370	3,310	3,030	1,660	478	390
23	1,880	2,160	2,130	1,880	2,040	2,420	4,460	3,280	3,080	1,420	478	385
24	1,880	2,180	2,110	1,890	2,050	2,500	4,600	3,210	3,100	1,230	478	380
25	1,890	2,200	2,100	1,890	2,060	2,510	5,010	3,250	3,110	1,210	478	375
26	1,960	2,210	2,080	1,890	2,080	2,600	5,260	3,300	3,080	1,170	478	380
27	2,030	2,220	2,070	1,900	2,100	2,680	5,350	3,300	2,980	973	470	380
28	2,060	2,210	2,050	1,900	2,110	2,700	5,450	3,290	2,930	902	455	375
29	2,060	2,170	2,030	1,900	------	2,600	5,540	3,310	2,820	888	435	370
30	2,050	2,120	2,020	1,900	------	2,580	5,610	3,420	2,660	846	405	370
31	2,090	------	2,010	1,900	------	2,600	------	3,510	------	786	400	------
TOTAL	52,650	66,840	66,120	59,240	55,850	72,340	116,350	143,540	99,250	50,585	16,489	12,010
MEAN	1,698	2,228	2,133	1,911	1,995	2,334	3,878	4,630	3,310	1,632	532	400
MAX	2,090	2,450	2,270	2,000	2,110	2,700	5,610	6,130	3,740	2,550	722	475
MIN	1,230	1,910	2,000	1,870	1,900	2,120	2,610	3,210	2,660	786	400	370
CFSM	.34	.44	.42	.38	.39	.46	.77	.92	.65	.32	.11	.08
IN.	.39	.49	.49	.44	.41	.53	.86	1.06	.73	.37	.12	.09

CAL YR 1969 TOTAL 961,678 MEAN 2,635 MAX 9,040 MIN 902 CFSM .52 IN 7.07
WTR YR 1970 TOTAL 811,304 MEAN 2,223 MAX 6,130 MIN 370 CFSM .44 IN 5.96

05227500 Mississippi River at Aitkin, Minn.

LOCATION.--Lat 46°32'26", long 93°42'26", in W½ sec.24, T.47 N., R.27 W., Aitkin County, at upstream side of highway bridge at north edge of Aitkin, 1 mile downstream from Mud River and at mile 1,055.9 upstream from Ohio River.

DRAINAGE AREA.--6,140 sq mi, approximately.

PERIOD OF RECORD.--March 1945 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,182.41 ft above mean sea level, datum of 1929 (levels by Corps of Engineers). Mar. 1, 1945, to Mar. 14, 1961, nonrecording gage, and Mar. 15, 1961, to Sept. 30, 1967, water-stage recorder at same site at datum 3.0 ft higher. Diversion channel: nonrecording gage. Datum of gage is 1,182.02 ft above mean sea level, datum of 1929. Apr. 9, 1955, to Apr. 10, 1956, nonrecording gage at site 4 miles downstream at different datum. Apr. 11, 1956, to Sept. 30, 1967, nonrecording gage at same site at datum 3.0 ft higher.

AVERAGE DISCHARGE.--25 years, 2,868 cfs (6.34 inches per year).

EXTREMES.--Current year: Maximum discharge, 9,380 cfs May 3; minimum, 389 cfs Sept. 30. River gage: Maximum discharge, 5,360 cfs May 3 (gage height, 13.42 ft); minimum, 389 cfs Sept. 30 (gage height, 1.39 ft). Diversion gage: Maximum discharge, 4,020 cfs May 3 (gage height, 13.25 ft); no flow on many days.
Period of record: Maximum discharge, 20,000 cfs May 20, 1950 (gage height, 22.49 ft, present datum); minimum, 151 cfs Sept. 1, 1961 (gage height, 0.60 ft).

REMARKS.--Records good except those for winter months, which are fair. Slight regulation by powerplants and by Winnibigoshish, Leech, Pokegama, and Sandy Lakes (see p. 101, 104, 106, 110). Water diverted at medium and high stages into Aitkin diversion channel 6.5 miles above station, bypasses station and returns to river 15.5 miles below station. Diversion began Apr. 2, 1955. These records include flow in diversion channel.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1,540	2,290	2,390	2,080	2,000	2,450	2,890	9,040	4,580	2,990	900	409
2	1,550	2,370	2,370	2,060	2,010	2,460	2,860	9,070	4,660	2,840	845	416
3	1,570	2,440	2,340	2,050	2,020	2,460	2,900	9,110	4,700	2,700	789	416
4	1,580	2,480	2,320	2,040	2,040	2,470	2,950	9,100	4,770	2,640	778	406
5	1,580	2,510	2,310	2,020	2,050	2,460	3,060	8,990	4,770	2,660	772	406
6	1,590	2,550	2,330	2,010	2,050	2,470	3,280	8,890	4,770	2,700	719	406
7	1,620	2,610	2,360	2,000	2,060	2,470	3,580	8,790	4,720	2,720	624	406
8	1,700	2,660	2,400	1,990	2,080	2,470	4,150	8,690	4,670	2,620	576	406
9	1,800	2,670	2,430	1,980	2,130	2,460	4,800	8,540	4,530	2,360	554	399
10	1,860	2,670	2,450	1,970	2,150	2,460	5,600	8,390	4,310	2,030	568	406
11	1,900	2,670	2,480	1,970	2,160	2,460	6,270	8,120	4,120	1,760	565	399
12	1,920	2,660	2,520	1,960	2,180	2,450	6,270	7,910	3,850	1,630	558	440
13	1,930	2,640	2,550	1,940	2,200	2,450	5,880	7,620	3,760	1,590	548	419
14	1,940	2,610	2,580	1,940	2,220	2,450	5,460	7,220	3,680	1,590	572	412
15	1,910	2,560	2,600	1,930	2,240	2,440	5,320	6,890	3,790	1,600	579	433
16	1,980	2,480	2,580	1,930	2,260	2,440	5,230	6,550	3,930	1,590	565	457
17	1,980	2,300	2,540	1,920	2,270	2,420	5,190	6,100	4,020	1,550	554	457
18	2,000	2,200	2,500	1,920	2,290	2,400	5,200	5,300	3,990	1,540	537	453
19	2,070	2,020	2,460	1,910	2,300	2,400	5,250	5,370	3,860	1,560	513	440
20	2,120	1,900	2,410	1,890	2,320	2,390	5,500	4,940	3,770	1,600	523	423
21	2,140	1,920	2,370	1,880	2,320	2,390	5,830	4,630	3,590	1,680	505	409
22	2,130	1,980	2,330	1,890	2,340	2,410	6,020	4,430	3,470	1,750	495	409
23	2,120	2,090	2,290	1,900	2,350	2,460	6,230	4,340	3,400	1,720	495	409
24	2,110	2,170	2,240	1,910	2,370	2,590	6,780	4,260	3,400	1,560	488	399
25	2,100	2,240	2,200	1,930	2,400	2,680	7,560	4,160	3,390	1,380	492	402
26	2,150	2,320	2,160	1,940	2,420	2,810	8,030	4,090	3,460	1,310	457	399
27	2,150	2,360	2,140	1,950	2,430	2,930	8,290	4,090	3,420	1,280	457	402
28	2,210	2,390	2,120	1,960	2,430	3,010	8,560	4,090	3,340	1,160	463	409
29	2,260	2,410	2,110	1,970	------	3,030	8,810	4,150	3,240	1,070	460	399
30	2,260	2,400	2,090	1,980	------	2,990	9,020	4,460	3,150	1,000	443	392
31	2,260	------	2,080	2,000	------	2,940	------	4,470	------	940	426	------
TOTAL	60,050	71,570	73,050	60,820	62,090	79,170	166,770	202,300	119,110	57,120	17,830	12,438
MEAN	1,937	2,386	2,356	1,962	2,218	2,554	5,559	6,526	3,970	1,843	575	415
MAX	2,280	2,670	2,600	2,080	2,430	3,030	9,020	9,110	4,770	2,990	900	457
MIN	1,540	1,900	2,080	1,880	2,000	2,390	2,860	4,090	3,150	940	426	392
CFSM	.32	.39	.38	.32	.36	.42	.91	1.06	.65	.30	.09	.07
IN.	.36	.43	.44	.37	.38	.48	1.01	1.23	.72	.35	.11	.08

CAL YR 1969 TOTAL 309,788 MEAN 849 MAX 14,400 MIN 1,100 CFSM .14 IN 1.88
WTR YR 1970 TOTAL 982,318 MEAN 2,691 MAX 9,110 MIN 392 CFSM .44 IN 5.95

05230500 Pine River Reservoir at Cross Lake, Minn.

LOCATION.--Lat 46°40'09", long 94°06'44", in SW¼NW¼ sec.21, T.137 N., R.27 W., Crow Wing County at dam on Pine River, at outlet of Cross Lake at village of Cross Lake.

DRAINAGE AREA.--562 sq mi.

PERIOD OF RECORD.--March 1886 to current year. Monthend contents only for some periods published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 1,216.32 ft above mean sea level, datum of 1929 (levels by Corps of Engineers). Prior to May 3, 1949, nonrecording gage at same site and datum.

EXTREMES.--Current year: Maximum contents, 98,340 acre-ft July 2 (gage height, 13.00 ft); minimum, 71,190 acre-ft Apr. 4, 5, 6, 7 (gage height, 10.96.
Period of record: Maximum contents observed, 173,600 acre-ft July 10, 1916 (gage height, 18.24 ft); minimum observed, 1,310 acre-ft below zero of capacity table Aug. 20, 1918 (gage height, 1.35 ft).

REMARKS.--Reservoir is formed by Trout, Whitefish, Rush, and Cross Lakes and several other natural Lakes controlled by timber crib dams; storage began in 1886; dam completed in 1886. Capacity between gage heights 10.00 ft and 18.5 ft (maximum allowable range) is 118,710 acre-ft of which 53,280 acre-ft is controlled storage between gage heights 10.00 ft and 14.00 ft (normal operating range). Contents shown herein are contents above a gage height of 2.35 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records furnished by Corps of Engineers in terms of cfs-days and converted to acre-feet by Geological Survey.

MONTHEND GAGE HEIGHT AND CONTENTS, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Date	Gage height (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept.30	12.48	91,240	-
Oct. 31	12.34	89,420	-1,820
Nov. 30	12.16	87,020	-2,400
Dec. 31	11.95	84,220	-2,800
CAL YR 1969	-	-	+2,100
Jan. 31	11.58	79,320	-4,900
Feb. 28	11.22	74,580	-4,740
Mar. 31	11.01	71,840	-2,740
Apr. 30	12.44	90,760	+18,920
May 31	12.87	96,580	+5,820
June 30	12.93	97,370	+790
July 31	12.67	93,880	-3,490
Aug. 31	12.21	87,690	-6,190
Sept.30	11.96	84,340	-3,350
WTR YR 1970	-	-	-6,900

05231000 Pine River at Cross Lake Dam, at Cross Lake, Minn.

LOCATION.--Lat 46°40'09", long 94°06'44", in SW¼NW¼ sec.21, T.137 N., R.27 W., Crow Wing County, at dam at outlet of Cross Lake at Village of Cross Lake.

DRAINAGE AREA.--562 sq mi.

PERIOD OF RECORD.--April 1886 to current year. Monthly discharge only for some periods, published in WSP 1308. Published as "below Pine River Reservoir" 1895-1916, 1929, and as "at Pine River Dam, at Cross Lake" 1941-56.

GAGE.--Water-stage recorder, headwater gage, and nonrecording tailwater gage, read twice daily. Datum of gages is 1,216.32 ft above mean sea level, datum of 1929. Mar. 26, 1886, to May 31, 1929, nonrecording gages on headwater and tailwater at same sites and datum. June 1 to Nov. 30, 1929, nonrecording gage in tailwater at datum 1.60 ft lower. Dec. 1, 1929, to May 2, 1949, nonrecording gage on headwater and Dec. 1, 1929, to August 1949, nonrecording gage on tailwater at present sites and datum.

AVERAGE DISCHARGE (~~unadjusted~~ UNADJUSTED).--84 years, 212 cfs (5.12 inches per year).

EXTREMES.--Current year: Maximum daily discharge, 535 cfs Apr. 30 to May 3; minimum daily, 35 cfs Sept. 1-30. Period of record: Maximum daily discharge, 2,250 cfs in June 1896 (does not include flow bypassing dam through crevasse); no flow at times.

REMARKS.--Discharge computed principally on basis of modified weir formula, the head being obtained from twice-daily readings on tailwater gage and from headwater recorder. Flow completely regulated by Pine River Reservoir (see preceding page).

COOPERATION.--Computations of daily discharge furnished by Corps of Engineers; two discharge measurements made and records reviewed by Geological Survey.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	70	185	230	240	225	220	220	535	392	140	45	35
2	70	185	230	240	225	220	220	535	392	140	45	35
3	70	185	240	240	225	220	220	535	395	140	45	35
4	70	185	240	240	225	220	220	490	392	158	45	35
5	70	185	240	240	225	220	220	390	392	225	45	35
6	74	185	240	240	230	220	220	357	392	225	45	35
7	120	185	240	240	230	220	220	280	392	218	45	35
8	133	185	240	240	230	220	220	255	392	161	45	35
9	170	185	240	240	230	220	220	250	290	94	45	35
10	175	185	240	240	230	220	220	245	270	60	45	35
11	175	185	240	240	230	220	220	245	162	60	45	35
12	180	185	240	235	225	220	220	250	143	60	45	35
13	180	185	240	240	225	220	220	235	135	60	45	35
14	180	185	240	235	225	220	220	236	185	60	45	35
15	180	185	240	240	225	220	193	325	185	60	45	35
16	180	175	240	235	225	220	60	530	185	60	45	35
17	185	175	240	235	225	220	60	520	180	57	45	35
18	185	188	240	240	225	220	50	405	180	50	45	35
19	185	225	240	235	220	220	45	405	180	50	40	35
20	185	225	245	235	225	220	45	363	180	50	40	35
21	185	225	245	230	225	220	45	290	180	45	40	35
22	185	225	240	230	225	220	66	290	180	45	40	35
23	185	225	245	230	220	220	130	290	180	45	40	35
24	185	230	245	225	225	220	135	290	180	45	40	35
25	185	235	245	225	220	220	135	320	180	45	40	35
26	185	230	245	225	220	220	135	390	145	45	40	35
27	185	230	245	225	220	220	140	357	140	45	40	35
28	185	230	240	225	220	220	180	290	140	45	40	35
29	185	230	240	225	------	220	390	290	140	45	40	35
30	185	230	240	225	------	220	535	390	140	45	40	35
31	185	------	240	225	------	220	------	395	------	45	40	------
TOTAL	4,872	6,053	7,455	7,260	6,300	6,820	5,424	10,978	7,019	2,623	1,330	1,050
MEAN	157	202	240	234	225	220	181	354	234	84.6	42.9	35.0
MAX	185	235	245	240	230	220	535	535	395	225	45	35
MIN	70	175	230	225	220	220	45	235	135	45	40	35
CFSM	.28	.36	.43	.42	.40	.39	.32	.63	.42	.15	.08	.06
IN.	.32	.40	.49	.48	.42	.45	.36	.73	.46	.17	.09	.07

CAL YR 1969 TOTAL 90,480 MEAN 248 MAX 940 MIN 40 CFSM .44 IN 5.99
WTR YR 1970 TOTAL 67,184 MEAN 184 MAX 535 MIN 35 CFSM .33 IN 4.45

05244000 Crow Wing River at Nimrod, Minn.

LOCATION.--Lat 46°38'25", long 94°52'44", in SE¼NW¼ sec.32, T.137 N., R.33 W., Wadena County, on right bank 200 ft upstream from highway bridge, 0.2 mile north of Nimrod, and 0.7 mile upstream from Cat River.

DRAINAGE AREA.--1,010 sq mi, approximately.

PERIOD OF RECORD.--April 1910 to September 1914, July 1930 to current year (winter records incomplete prior to 1940).

GAGE.--Water-stage recorder. Datum of gage is 1,313.27 ft above mean sea level, datum of 1929 (levels by Wadena County Highway Department from Minnesota Highway Department bench mark). Apr. 15, 1910, to Sept. 30, 1914, nonrecording gage at same site, at datum 2.2 ft lower. July 28, 1930, to Nov. 4, 1949, nonrecording gages at same site and datum.

AVERAGE DISCHARGE.--31 years (1939-70), 475 cfs (6.39 inches per year).

EXTREMES.--Current year: Maximum discharge, 1,750 cfs May 3 (gage height, 4.71 ft); maximum gage height, 6.21 ft Apr. 9, backwater from ice; minimum discharge, 187 cfs Nov. 19 (gage height, 2.51 ft, result of freezeup).
Period of record: Maximum discharge, 2,890 cfs Apr. 13, 1965 (gage height, 7.57 ft, backwater from ice); maximum gage height, 7.64 ft Apr. 20, 1950, backwater from ice; minimum discharge observed, 45 cfs Aug. 7, 1936.

REMARKS.--Records good except those for winter months, which are fair. Flow affected by natural storage in many lakes. Records of water temperatures and suspended sediment loads for the water year 1970 are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 1508: 1910-11, 1913-14, 1937, 1942(M), 1944(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	402	568	520	355	304	346	370	1,560	776	493	308	260
2	408	556	508	350	306	346	365	1,670	743	470	306	258
3	402	538	520	340	306	346	365	1,740	720	450	303	254
4	436	532	538	330	308	346	375	1,730	698	443	299	250
5	772	532	542	325	310	344	400	1,650	668	421	296	244
6	798	550	540	320	310	346	480	1,550	644	394	289	234
7	805	556	520	310	312	344	650	1,450	619	365	279	239
8	798	556	510	305	314	344	770	1,380	587	336	287	246
9	805	544	506	305	318	344	820	1,320	549	319	293	247
10	818	538	504	300	320	342	830	1,260	539	303	286	249
11	818	526	502	300	320	340	824	1,190	540	288	280	252
12	812	514	495	295	320	340	818	1,140	541	283	271	250
13	798	502	490	295	322	336	822	1,090	576	279	261	250
14	779	472	480	290	326	332	847	1,050	600	276	259	259
15	753	386	470	290	330	330	875	1,050	655	275	255	272
16	720	446	465	290	330	330	898	1,030	707	267	254	275
17	688	438	460	290	336	330	882	991	701	262	254	280
18	636	361	450	290	340	335	852	952	686	258	250	279
19	586	250	440	295	340	335	824	921	676	255	252	277
20	562	308	430	295	342	340	793	873	669	259	247	277
21	538	422	425	295	344	350	782	843	648	254	239	320
22	532	600	420	295	346	360	807	823	628	250	240	348
23	538	598	415	295	346	370	859	805	612	244	247	350
24	538	558	410	300	346	375	999	807	603	241	242	350
25	538	524	405	300	346	380	1,190	821	587	237	235	356
26	544	542	400	298	346	390	1,230	811	589	240	228	352
27	544	564	395	298	346	385	1,250	774	569	247	227	351
28	538	602	390	300	346	380	1,430	746	539	242	229	346
29	544	590	380	300	------	375	1,480	735	522	248	235	337
30	538	566	370	302	------	370	1,490	746	510	275	245	331
31	550	------	365	302	------	370	------	756	------	316	251	------
TOTAL	19,538	15,239	14,265	9,455	9,180	10,901	25,377	34,264	18,701	9,490	8,147	8,593
MEAN	630	508	460	305	328	352	846	1,105	623	306	263	286
MAX	818	602	542	355	346	390	1,490	1,740	776	493	308	356
MIN	402	250	365	290	304	330	365	735	510	237	227	234
CFSM	.62	.50	.46	.30	.32	.35	.84	1.09	.62	.30	.26	.28
IN.	.72	.56	.53	.35	.34	.40	.93	1.26	.69	.35	.30	.32

CAL YR 1969 TOTAL 204,896 MEAN 561 MAX 2,180 MIN 250 CFSM .56 IN 7.55
WTR YR 1970 TOTAL 183,150 MEAN 502 MAX 1,740 MIN 227 CFSM .50 IN 6.75

05246500 Gull Lake near Brainerd, Minn.

LOCATION.--Lat 46°24'40", long 94°21'26", in N½ sec.20, T.134 N., R.29 W., Cass County, in pool of dam on Gull River, 800 ft south of outlet of Gull Lake, a quarter of a mile upstream from Gull Lake Dam, and 8 miles northwest of Brainerd.

DRAINAGE AREA.--287 sq mi.

PERIOD OF RECORD.--August 1911 to current year. Prior to October 1941 monthend contents only, published in WSP 1308. Published as Gull Lake Reservoir October 1941 to September 1956.

GAGE.--Water-stage recorder. Datum of gage is 1,188.14 ft above mean sea level, adjustment of 1912. Prior to Aug. 10, 1949, nonrecording gage 800 ft north of present site at same datum.

EXTREMES.--Current year: Maximum contents, 59,190 acre-ft June 15, 16 (gage height, 6.11 ft); minimum, 45,320 acre-ft Jan. 31 (gage height, 5.04 ft).
Period of record: Maximum contents, 74,800 acre-ft June 30, 1914 (gage height, 7.30 ft); minimum observed, 22,250 acre-ft Mar. 20, 1924 (gage height, 3.00 ft).

REMARKS.--Reservoir is formed by Gull Lake and several other natural lakes controlled by concrete dam completed in 1913; storage began in 1912. Capacity between gage heights 5.00 ft and 7.00 ft (maximum allowable range and normal operating range) is 26,020 acre-ft. Contents shown herein are contents above gage height 1.00 ft. Water is used to benefit navigation on Mississippi River below Minneapolis.

COOPERATION.--Records furnished by Corps of Engineers, in terms of cfs-days and converted to acre-feet by Geological Survey.

MONTHEND GAGE HEIGHT AND CONTENTS, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Date	Gage height (feet)	Contents (acre-feet)	Change in contents (acre-feet)
Sept.30	5.84	55,740	-
Oct. 31	5.52	51,550	-4,190
Nov. 30	5.30	48,690	-2,860
Dec. 31	5.20	47,410	-1,280
CAL YR 1969	-	-	-190
Jan. 31	5.04	45,320	-2,090
Feb. 28	5.07	45,720	+400
Mar. 31	5.19	47,290	+1,570
Apr. 30	6.08	58,810	+11,520
May 31	6.08	58,810	0
June 30	6.04	58,280	-530
July 31	6.02	58,020	-260
Aug. 31	5.67	53,480	-4,540
Sept.30	5.49	51,150	-2,330
WTR YR 1970	-	-	+4,590

05247000 Gull River at Gull Lake Dam, near Brainerd, Minn.

LOCATION.--Lat 46°24'40", long 94°21'12", in sec.20, T.134 N., R.29 W., Cass County, in headwater and tailwater of dam at outlet of Gull Lake, 8 miles northwest of Brainerd.

DRAINAGE AREA.--287 sq mi.

PERIOD OF RECORD.--August 1911 to current year. Monthly discharge only for some periods, published in WSP 1308. Published as "at Gull Lake Reservoir" 1929.

GAGE.--Water-stage recorder on headwater and nonrecording gage on tailwater. Datum of gages is 1,188.14 ft above mean sea level, adjustment of 1912. August 1911 to May 23, 1929, and Dec. 1, 1929, to Aug. 1, 1949, both gages were nonrecording gages at same site and datum. May 24 to Nov. 30, 1929, nonrecording gage 500 ft downstream at different datum.

AVERAGE DISCHARGE (UNADJUSTED).--59 years, 104 cfs (4.92 inches per year).

EXTREMES.--Current year: Maximum daily discharge, 714 cfs Apr. 29 to May 1; minimum daily, 10 cfs July 7 to Sept. 30.
Period of record: Maximum daily discharge, 1,120 cfs May 15, 1938; no flow at times.

REMARKS.--Discharge computed at dam on basis of modified weir formulas, the head being obtained from twice-daily readings on tailwater gage and from headwater recorder. Flow completely regulated by Gull Lake (see preceding page.

COOPERATION.--Computations of daily discharge furnished by Corps of Engineers; two discharge measurements made and records reviewed by Geological Survey.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	103	128	112	48	52	65	714	272	105	10	10
2	35	103	128	111	48	52	65	704	268	105	10	10
3	33	101	126	109	48	55	65	696	264	107	10	10
4	34	101	123	109	48	61	65	538	261	105	10	10
5	57	100	121	107	48	61	65	323	257	81	10	10
6	112	100	121	103	48	62	66	223	178	47	10	10
7	148	100	122	101	48	62	68	228	107	10	10	10
8	144	100	125	100	47	62	72	173	105	10	10	10
9	141	100	128	99	47	62	78	175	52	10	10	10
10	138	99	131	97	48	62	83	176	55	10	10	10
11	135	100	128	99	49	62	88	178	139	10	10	10
12	132	99	126	97	48	61	92	178	188	10	10	10
13	131	97	126	97	47	62	97	178	353	10	10	10
14	128	93	125	96	47	63	100	180	349	10	10	10
15	123	92	122	97	48	62	106	240	345	11	10	10
16	123	90	121	97	49	62	55	261	379	10	10	10
17	122	92	121	96	50	62	60	257	418	10	10	10
18	118	96	121	92	50	63	37	181	363	10	10	10
19	115	118	119	91	50	63	43	181	292	10	10	10
20	114	136	116	88	50	63	45	180	173	10	10	10
21	111	136	118	87	50	63	153	181	172	10	10	10
22	109	138	114	86	50	63	223	185	104	10	10	10
23	104	139	115	86	50	63	306	185	49	10	10	10
24	103	138	114	87	51	63	308	185	53	10	10	10
25	103	138	114	88	51	63	313	225	51	10	10	10
26	104	138	112	88	52	63	323	264	56	10	10	10
27	103	135	111	77	50	63	366	229	111	10	10	10
28	99	135	112	48	51	63	557	107	108	10	10	10
29	97	132	115	47	------	64	714	144	108	10	10	10
30	96	131	112	48	------	65	714	271	105	10	10	10
31	96	------	112	48	------	65	------	270	------	10	10	------
TOTAL	3,243	3,380	3,727	2,788	1,371	1,912	5,392	8,210	5,735	801	310	300
MEAN	105	113	120	89.9	49.0	61.7	180	265	191	25.8	10.0	10.0
MAX	148	139	131	112	52	65	714	714	418	107	10	10
MIN	33	90	111	47	47	52	37	107	49	10	10	10
CFSM	.37	.39	.42	.31	.17	.22	.63	.92	.67	.09	.03	.03
IN.	.42	.44	.48	.36	.18	.25	.70	1.06	.74	.10	.04	.04

CAL YR 1969 TOTAL 43,840 MEAN 120 MAX 660 MIN 10 CFSM .42 IN 5.68
WTR YR 1970 TOTAL 37,169 MEAN 102 MAX 714 MIN 10 CFSM .36 IN 4.82

05267000 Mississippi River near Royalton, Minn.

LOCATION.--Lat 45°51'40", long 94°21'30", in lot 2, sec.20, T.39 N., R.32 W., Morrison County, at plant of Minnesota Power & Light Co., 4 miles northwest of Royalton, and 4.5 miles downstream from Swan River, and at mile 956 upstream from Ohio River.

DRAINAGE AREA.--11,600 sq mi, approximately.

PERIOD OF RECORD.--March 1924 to current year.

AVERAGE DISCHARGE.--46 years, 4,167 cfs (4.88 inches per year).

EXTREMES.--Current year: Maximum daily discharge, 18,800 cfs May 2, 3; minimum daily, 818 cfs Sept. 11.
Period of record: Maximum daily discharge, 37,700 cfs Apr. 16, 1965; minimum daily, 254 cfs Nov. 25, 1936.

REMARKS.--Records good. Discharge computed on basis of powerplant records. Flow partly regulated by powerplants and Winnibigoshish, Leech, Pokegama, Sandy, and Gull Lakes and by Pine River Reservoir (see p. 101, 104, 106, 110, 114, 117).

COOPERATION.--Records collected by Minnesota Power & Light Co. under general supervision of Geological Survey, in connection with a Federal Power Commission project.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2,320	3,780	3,930	3,530	3,210	3,130	4,370	18,500	8,140	4,840	1,920	863
2	2,320	3,820	3,730	3,630	3,210	3,130	4,590	18,800	8,850	4,720	1,630	963
3	2,500	3,930	3,590	3,560	3,380	3,160	4,250	18,800	8,780	4,240	1,600	940
4	2,710	4,160	3,680	3,460	3,360	3,360	3,660	18,200	9,110	4,240	1,440	930
5	2,520	4,100	3,040	3,430	3,300	3,260	3,850	17,800	8,080	3,800	1,340	953
6	2,800	4,170	3,850	3,430	3,260	3,160	4,170	17,300	7,990	3,780	1,240	956
7	3,990	4,030	3,540	3,450	3,230	3,230	4,390	16,800	7,540	4,060	1,460	897
8	3,550	4,100	3,640	3,300	3,230	3,200	6,180	16,100	7,240	4,060	1,400	940
9	3,560	4,230	3,290	3,430	3,180	3,230	8,140	15,200	6,930	3,600	1,330	857
10	3,760	4,180	3,230	3,430	3,160	3,270	9,560	14,500	7,030	3,460	1,330	848
11	3,670	4,200	3,280	3,430	3,220	3,320	11,500	13,800	6,590	3,350	1,250	818
12	3,710	4,160	3,400	3,190	3,230	3,310	13,500	13,200	7,010	2,770	1,300	819
13	3,840	4,170	3,100	3,300	3,230	3,480	13,400	13,000	6,420	2,450	997	897
14	3,630	4,020	3,000	3,440	3,230	3,230	12,700	12,400	6,200	3,070	1,280	970
15	3,630	3,330	2,670	3,260	3,230	3,180	12,200	12,400	6,560	3,280	1,130	1,040
16	3,700	3,570	2,810	3,330	3,230	3,350	11,300	10,400	7,050	2,410	1,020	1,110
17	3,700	3,830	3,090	3,250	3,260	3,340	10,900	10,700	7,410	2,170	1,150	1,120
18	3,630	4,230	3,590	3,300	3,140	3,430	10,500	10,700	7,540	2,380	1,130	897
19	3,590	2,880	3,440	3,230	3,230	3,260	11,000	10,400	7,540	2,380	940	1,080
20	3,300	2,570	3,260	3,360	3,160	3,350	11,700	9,650	7,120	2,330	1,010	1,220
21	3,430	2,520	3,260	3,290	3,230	3,210	11,100	9,640	7,090	2,130	963	1,090
22	3,700	2,360	3,230	3,230	3,200	3,410	12,000	8,620	6,980	2,320	1,050	1,060
23	3,580	3,170	3,560	3,200	3,080	3,370	12,700	7,250	6,520	2,270	930	836
24	3,230	3,720	3,360	3,180	3,180	3,410	13,500	7,810	6,180	2,380	1,030	942
25	3,410	3,670	3,230	3,180	3,140	3,530	14,600	8,060	6,110	2,470	963	1,020
26	3,340	3,870	3,560	3,230	3,190	3,710	14,400	7,130	5,810	2,320	1,060	1,050
27	3,650	3,460	3,430	3,090	3,250	3,860	14,700	7,910	5,680	2,170	965	1,020
28	3,310	3,280	3,500	3,210	3,160	3,680	17,100	7,620	5,680	1,990	997	1,030
29	3,350	3,470	3,590	3,230	------	3,900	18,000	7,730	5,680	1,790	986	1,030
30	3,730	3,640	3,560	3,220	------	3,920	18,000	8,250	5,460	1,870	967	1,060
31	3,740	------	3,540	3,260	------	4,200	------	7,810	------	1,810	848	------
TOTAL	104,900	110,620	104,980	103,060	90,110	105,580	317,960	376,480	210,320	90,910	36,656	29,256
MEAN	3,384	3,687	3,386	3,325	3,218	3,406	10,600	12,140	7,011	2,933	1,182	975
MAX	3,990	4,230	3,930	3,630	3,380	4,200	18,000	18,800	9,110	4,840	1,920	1,220
MIN	2,320	2,360	2,670	3,090	3,080	3,130	3,660	7,130	5,460	1,790	848	818
CFSM	.29	.32	.29	.29	.28	.29	.91	1.05	.60	.25	.10	.084
IN.	.34	.35	.34	.33	.29	.34	1.02	1.21	.67	.29	.12	.09

CAL YR 1969 TOTAL 2,166,280 MEAN 5,935 MAX 32,400 MIN 1,630 CFSM .51 IN 6.95
WTR YR 1970 TOTAL 1,680,832 MEAN 4,605 MAX 18,800 MIN 818 CFSM .40 IN 5.39

05270500 Sauk River near St. Cloud, Minn.

LOCATION.--Lat 45°33'35", long 94°14'00", in SE¼SW¼ sec.8, T.124 N., R.28 W., Stearns County, on right bank 0.5 mile northwest of Waite Park, 3 miles west of St. Cloud, and 5 miles upstream from mouth.

DRAINAGE AREA.--925 sq mi.

PERIOD OF RECORD.--July 1909 to December 1912, April to December 1913, May to November 1929, March 1930 to September 1931, April to November 1932, March to November 1933, March 1934 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 1,034.95 ft above mean sea level, adjustment of 1912. Prior to Nov. 22, 1934, nonrecording gage on highway bridge 1 mile downstream at datum 6.77 ft lower.

AVERAGE DISCHARGE.--40 years (1909-12, 1930-31, 1934-70), 253 cfs (3.71 inches per year).

EXTREMES.--Current year: Maximum daily discharge, 910 cfs Apr. 26; minimum, 41 cfs Sept. 29 (gage height, 0.88 ft).
Period of record: Maximum discharge, 9,100 cfs Apr. 13, 1965 (gage height, 10.68 ft); minimum, 0.3 cfs Nov. 26, 1936.

REMARKS.--Records good except those for winter months, which are fair. Flow regulated by powerplants and reservoirs above station.

REVISIONS (WATER YEARS).--WSP 895: Drainage area. WSP 1308: 1912(M), 1932(M), WSP 1508: 1937(m).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	57	85	82	108	73	66	222	711	339	418	113	51
2	61	87	84	106	72	66	230	683	335	392	106	54
3	60	86	86	104	72	67	240	652	320	378	100	54
4	61	89	90	102	72	70	242	610	312	348	92	52
5	67	90	93	100	71	73	246	563	293	305	89	53
6	68	89	95	100	71	75	248	527	280	281	88	53
7	72	92	98	98	70	77	250	500	272	260	88	54
8	75	93	102	97	70	80	312	478	260	234	96	52
9	72	90	106	96	69	85	385	447	243	201	91	51
10	76	88	110	95	68	87	488	430	226	184	90	54
11	70	85	115	93	68	91	565	393	236	172	82	51
12	66	80	118	91	68	96	621	291	216	166	81	51
13	72	78	122	90	68	100	657	274	271	191	79	51
14	77	74	124	88	67	105	635	279	269	194	79	54
15	76	70	124	86	67	110	594	323	314	203	90	62
16	73	64	125	85	67	115	590	324	412	182	85	57
17	76	58	126	84	67	120	554	302	448	169	76	56
18	74	50	126	83	67	130	492	295	492	158	74	53
19	73	48	125	82	66	140	539	270	507	163	73	52
20	72	48	124	81	66	150	644	253	612	142	70	52
21	77	48	122	80	66	152	680	262	686	136	67	50
22	79	49	122	79	66	156	674	250	697	128	66	49
23	76	50	120	78	66	160	800	257	693	117	62	49
24	76	53	120	78	66	162	870	276	673	107	58	55
25	75	56	118	77	66	165	900	300	631	105	54	53
26	75	60	118	76	66	170	910	284	634	99	51	51
27	79	66	116	76	66	170	890	245	591	106	48	50
28	75	70	116	75	66	170	840	242	542	106	47	49
29	71	75	114	75	------	180	790	290	509	121	53	48
30	71	78	112	74	------	190	758	334	453	124	54	47
31	81	------	110	73	------	205	------	333	------	119	51	------
TOTAL	2,233	2,149	3,463	2,710	1,907	3,783	16,866	11,678	12,766	6,009	2,353	1,568
MEAN	72.0	71.6	112	87.4	68.1	122	562	377	426	194	75.9	52.3
MAX	81	93	126	108	73	205	910	711	697	418	113	62
MIN	57	48	82	73	66	66	222	242	216	99	47	47
CFSM	.078	.077	.12	.095	.074	.13	.61	.41	.46	.21	.082	.057
IN.	.09	.09	.14	.11	.08	.15	.68	.47	.51	.24	.09	.06

CAL YR 1969 TOTAL 165,220 MEAN 453 MAX 5,250 MIN 45 CFSM .49 IN 6.64
WTR YR 1970 TOTAL 67,485 MEAN 185 MAX 910 MIN 47 CFSM .20 IN 2.71

05274700 St. Francis River at Santiago, Minn.

LOCATION.--Lat 45°32'30", long 93°48'50", in NE¼ sec.10, T.35 N., R.28 W., Sherburne County, on right bank, 0.2 mile east of Santiago and 0.4 mile upstream from bridge on county road.

PERIOD OF RECORD.--June 1965 to September 1970 (discontinued).

GAGE.--Water-stage recorder.

AVERAGE DISCHARGE.--5 years, 38.4 cfs.

EXTREMES.--Current year: Maximum discharge, 592 cfs Apr. 21 (gage height, 8.57 ft); minimum, 1.1 cfs July 16, 17 (gage height, 3.28 ft).
Period of record: Maximum discharge, 2,970 cfs Apr. 7, 1969 (gage height, 11.42 ft); minimum, 0.1 cfs July 10, 1966, minimum gage height 3.22 ft Sept. 12, 1967.
Flood of Apr. 14, 1965 reached a stage of 12.17 ft, backwater from ice (discharge, 2,940 cfs).

REMARKS.--Records good except those for winter periods, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.1	5.8	4.1	3.0	2.5	2.6	11	61	13	2.6	1.4	1.5
2	3.1	5.3	4.2	2.9	2.5	2.7	12	51	11	2.6	1.4	1.6
3	2.8	4.2	4.3	2.9	2.5	2.7	10	42	9.1	2.3	1.4	1.6
4	2.8	4.4	4.1	2.8	2.5	2.8	11	34	7.2	2.3	1.4	1.5
5	3.0	3.8	4.0	2.8	2.5	2.9	19	28	5.8	2.1	1.4	1.4
6	3.0	4.0	3.9	2.7	2.5	3.0	31	22	4.8	2.1	1.3	1.5
7	2.7	4.0	3.9	2.7	2.5	3.0	76	19	4.2	2.0	1.6	1.5
8	2.6	4.2	3.8	2.6	2.5	3.1	284	17	4.4	1.9	1.8	3.0
9	2.6	4.0	3.8	2.6	2.5	3.1	371	15	3.0	2.1	1.6	7.7
10	2.4	3.8	3.8	2.6	2.5	3.2	349	14	2.8	1.9	1.6	2.0
11	2.4	4.0	3.7	2.6	2.5	3.2	230	13	2.6	1.8	1.5	1.6
12	2.7	3.8	3.7	2.6	2.5	3.3	155	13	3.0	3.6	1.6	1.4
13	3.6	3.6	3.6	2.5	2.5	3.4	107	12	5.3	10	1.6	1.4
14	3.6	3.3	3.6	2.4	2.6	3.4	77	10	6.1	1.9	1.5	1.5
15	3.3	3.3	3.6	2.4	2.6	3.5	60	10	10	1.6	1.8	1.9
16	3.3	3.4	3.6	2.4	2.6	3.5	52	11	36	1.2	1.6	1.8
17	3.1	3.5	3.5	2.4	2.6	3.6	48	10	44	1.2	1.6	1.8
18	3.1	3.5	3.5	2.4	2.6	3.7	44	9.5	32	5.3	1.6	1.9
19	3.0	3.5	3.4	2.4	2.6	3.8	42	8.8	20	2.8	1.6	1.9
20	3.4	3.5	3.4	2.4	2.6	4.0	390	7.5	15	2.0	1.5	1.9
21	3.4	3.4	3.3	2.4	2.6	4.0	570	7.5	14	1.4	1.5	1.9
22	3.1	3.3	3.3	2.4	2.6	4.1	450	11	13	1.2	1.5	2.0
23	3.0	3.2	3.3	2.4	2.6	4.2	470	10	10	1.2	1.4	2.1
24	3.0	3.2	3.2	2.4	2.6	4.4	482	11	8.2	1.2	1.4	3.6
25	3.0	3.3	3.2	2.4	2.6	4.5	393	11	6.1	1.2	1.4	1.7
26	3.1	3.5	3.2	2.5	2.6	4.8	268	10	6.1	1.4	1.4	1.4
27	3.0	3.6	3.2	2.5	2.6	5.2	178	10	5.3	2.3	1.4	1.4
28	3.0	3.7	3.1	2.5	2.6	5.7	126	9.8	4.6	1.7	1.4	1.4
29	3.0	3.8	3.1	2.5	------	6.2	97	14	3.3	1.6	1.8	1.5
30	3.1	3.9	3.1	2.5	------	7.0	76	10	2.6	1.7	1.8	1.4
31	5.3	------	3.0	2.5	------	8.0	------	11	------	1.5	1.6	------
TOTAL	95.6	113.8	110.5	79.1	71.5	122.6	5,489	523.1	312.5	69.7	47.4	58.8
MEAN	3.08	3.79	3.56	2.55	2.55	3.95	183	16.9	10.4	2.25	1.53	1.96
MAX	5.3	5.8	4.3	3.0	2.6	8.0	570	61	44	10	1.8	7.7
MIN	2.4	3.2	3.0	2.4	2.5	2.6	10	7.5	2.6	1.2	1.3	1.4

CAL YR 1969 TOTAL 21,277.7 MEAN 58.3 MAX 2,600 MIN 2.4
WAT YR 1970 TOTAL 7,093.6 MEAN 19.4 MAX 570 MIN 1.2

05274900 St. Francis River near Big Lake, Minn.

LOCATION.--Lat 45°23'07", long 93°44'02", in NW¼NW¼ sec.5, T.33 N., R.27 W., Sherburne County, on right bank 3.6 miles north of Big Lake and 4 miles upstream from mouth.

PERIOD OF RECORD.--May 1965 to September 1970 (discontinued).

GAGE.--Water-stage recorder. Altitude of gage is 925 ft (from topographic map).

AVERAGE DISCHARGE.--5 years, 108 cfs.

EXTREMES.--Current year: Maximum discharge, 580 cfs Apr. 28 (gage height, 8.71 ft); minimum, 23 cfs Aug. 28, (gage height, 4.27 ft).
Period of record: Maximum discharge, 2,110 Apr. 10, 1969; (gage height, 10.47 ft); minimum daily discharge, 20 cfs Feb. 19-22; minimum gage height, 4.27 ft Aug. 28, 1970. Flood of Apr. 16, 1965 reached a stage of 11.34 ft, from floodmarks (discharge 2,700 cfs).

REMARKS.--Records good except those for winter periods, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	43	57	46	32	31	28	55	440	80	46	39	31
2	42	56	45	32	30	28	53	384	74	47	32	31
3	41	55	44	32	30	29	55	336	69	43	32	30
4	40	53	43	32	30	29	60	301	64	42	31	30
5	39	52	42	31	30	29	68	271	59	40	31	29
6	43	51	41	31	30	29	81	242	54	38	30	28
7	43	50	40	31	30	29	98	217	51	36	30	30
8	43	49	39	31	30	29	128	197	48	35	38	28
9	42	48	37	31	30	30	152	174	44	35	40	27
10	39	49	36	31	30	30	165	152	41	35	36	28
11	39	49	35	31	30	30	173	128	41	34	34	29
12	42	49	34	31	29	30	178	107	40	34	33	28
13	47	48	34	31	29	30	185	88	45	34	34	26
14	51	45	33	31	29	30	197	78	49	36	32	27
15	48	47	33	31	29	30	219	74	51	36	35	33
16	48	46	32	31	29	30	241	71	80	35	36	34
17	51	45	32	31	29	31	262	69	100	33	33	33
18	48	42	32	31	29	31	278	64	91	33	32	33
19	47	44	32	31	29	31	301	60	84	50	32	33
20	50	50	32	31	29	31	304	56	84	50	31	32
21	51	49	32	31	29	32	289	53	90	42	30	32
22	50	48	32	31	29	35	275	76	89	38	29	32
23	48	47	32	31	29	38	272	78	84	36	28	32
24	46	44	32	31	29	38	267	72	75	34	27	34
25	44	48	32	31	28	47	293	73	68	33	27	37
26	45	48	32	31	28	48	395	74	62	32	25	38
27	46	48	32	31	28	50	520	72	59	37	25	35
28	44	47	32	31	28	51	566	74	55	38	23	34
29	43	47	32	31	------	54	535	74	51	36	32	33
30	43	46	32	31	------	55	490	75	49	36	35	32
31	51	------	32	31	------	54	------	82	------	35	33	------
TOTAL	1,397	1,457	1,094	965	820	1,096	7,155	4,312	1,931	1,169	985	939
MEAN	45.1	48.6	35.3	31.1	29.3	35.4	239	139	64.4	37.7	31.8	31.3
MAX	51	57	46	32	31	55	566	440	100	50	40	38
MIN	39	42	32	31	28	28	53	53	40	32	23	26

CAL YR 1969 TOTAL 48,710 MEAN 133 MAX 2,100 MIN 32
WAT YR 1970 TOTAL 23,320 MEAN 63.9 MAX 566 MIN 23

05275000 Elk River near Big Lake, Minn.

LOCATION.--Lat 45°20'02", long 93°40'00", in NE¼SW¼ sec.23, T.33 N., R.27 W., Sherburne County, on right bank at upstream side of highway bridge, 4 miles east of Big Lake and 4 miles downstream from St. Francis River.

DRAINAGE AREA.--615 sq mi.

PERIOD OF RECORD.--April 1911 to September 1917, April to September 1931, April to November 1932, March to November 1933, March 1934 to current year.

GAGE.--Water-stage recorder. Datum of gage is 899.60 ft above mean sea level, datum of 1929. April 1911 to Sept. 30, 1917, Apr. 1, 1931, to July 26, 1934, nonrecording gage at same site and datum.

AVERAGE DISCHARGE.--42 years (1911-17, 1934-70), 250 cfs (5.52 inches per year).

EXTREMES.--Current year: Maximum discharge, 1,200 cfs Apr. 28 (gage height, 4.01 ft); minimum, 53 cfs Aug. 27, 28 (gage height, 0.74 ft).
Period of record: Maximum discharge, 7,360 cfs Apr. 16, 1965 (gage height, 10.86 ft); minimum, 3.6 cfs July 31, 1934.

REMARKS.--Records good except those for winter periods, which are fair. Records of chemical analyses for the water year 1970 are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 895: 1939. WSP 1308: 1912(M), 1915-17(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	113	152	134	100	54	96	168	1,000	286	164	99	73
2	111	150	130	96	54	96	172	900	276	174	94	71
3	108	147	120	95	54	98	178	800	261	155	89	70
4	105	143	114	93	54	100	183	715	244	145	82	67
5	104	141	117	91	54	100	200	654	229	133	78	65
6	115	139	120	90	54	100	230	584	212	122	75	65
7	115	136	122	88	54	100	290	519	198	116	76	66
8	112	134	124	86	54	100	366	468	184	109	93	61
9	111	134	126	84	54	100	412	427	169	105	98	58
10	105	133	128	82	54	100	445	394	159	100	92	63
11	99	131	130	80	54	100	496	360	164	97	85	64
12	102	136	134	78	54	99	584	328	166	94	84	62
13	115	140	137	76	54	98	645	306	191	102	83	61
14	125	143	140	74	54	98	642	291	198	112	80	66
15	124	140	143	72	54	99	617	282	209	114	88	81
16	124	139	145	70	55	102	593	272	312	102	88	86
17	124	138	146	68	57	104	569	261	352	92	80	83
18	122	139	143	66	59	106	555	248	332	90	73	84
19	122	140	141	63	62	108	602	233	320	130	73	82
20	126	142	138	61	66	111	688	227	323	159	69	81
21	128	142	133	59	71	114	698	218	323	141	66	81
22	125	142	130	58	78	117	697	284	305	127	61	81
23	123	142	127	57	86	120	775	293	282	113	60	79
24	119	141	123	55	91	124	869	291	260	102	59	90
25	116	138	120	54	93	128	898	286	242	96	58	96
26	117	136	115	54	94	134	938	273	231	92	57	100
27	117	135	112	54	96	138	1,090	265	218	114	55	93
28	116	134	110	54	96	144	1,190	281	203	118	55	88
29	116	133	107	54	------	150	1,180	278	186	107	74	85
30	139	135	104	54	------	155	1,100	284	175	106	84	82
31	154	------	101	54	------	162	------	285	------	105	78	------
TOTAL	3,652	4,175	3,914	2,220	1,814	3,501	18,070	12,307	7,210	3,636	2,386	2,284
MEAN	118	139	126	71.6	64.8	113	602	397	240	117	77.0	76.1
MAX	154	152	146	100	96	162	1,190	1,000	352	174	99	100
MIN	99	131	101	54	54	96	168	218	159	90	55	58
CFSM	.19	.23	.21	.12	.11	.18	.98	.65	.39	.19	.13	.12
IN.	.22	.25	.24	.13	.11	.21	1.09	.74	.44	.22	.14	.14

CAL YR 1969 TOTAL 128,171 MEAN 351 MAX 5,800 MIN 84 CFSM .57 IN 7.75
WTR YR 1970 TOTAL 65,169 MEAN 179 MAX 1,190 MIN 54 CFSM .29 IN 3.94

05278000 Middle Fork Crow River near Spicer, Minn.

LOCATION.--Lat 45°15'45", long 94°48'10", in NE¼ sec.27, T.121 N., R.33., Kandiyohi County, on right bank 75 ft upstream from highway bridge, 1.5 miles downstream from Lake Calhoun, 3 miles downstream from Green Lake, and 6.8 miles northeast of Spicer.

DRAINAGE AREA.--179 sq mi, approximately.

PERIOD OF RECORD.--March 1949 to current year.

GAGE.--Water-stage recorder and concrete and steel V-notch sharp-crested weir. Datum of gage is 1,147.93 ft above mean sea level, datum of 1929 (Kandiyohi County Highway Department bench mark). Prior to July 20, 1950, nonrecording gage at bridge 75 ft downstream at same datum.

AVERAGE DISCHARGE.--21 years, 48.7 cfs (3.69 inches per year).

EXTREMES.--Current year: Maximum discharge, 189 cfs July 13 (gage height, 4.03 ft); minimum daily, 1.8 cfs Jan. 6-20; minimum gage height, 1.99 ft on Oct. 30.
Period of record: Maximum discharge, 408 cfs June 29, 1953; maximum gage height, 6.67 ft June 25, 1957; no flow Mar. 15-24, 1949, Feb. 26 to Mar. 26, 1960, Dec. 8, 1963, Feb. 10-21, 1965, Feb. 19-28, 1968.

REMARKS.--Records good except those for winter period, which are fair. Flow affected by natural storage and some regulation from lakes above station.

REVISIONS (WATER YEARS).--WSP 1508: 1949(M), 1950.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.0	2.8	2.8	2.1	3.2	13	38	147	124	44	31	6.0
2	4.7	2.8	2.8	2.0	3.6	13	44	147	116	60	30	5.6
3	4.2	2.8	2.8	2.0	4.1	13	48	149	111	57	27	6.6
4	4.2	2.7	2.8	1.9	4.6	14	53	145	106	52	25	6.0
5	5.6	2.5	2.8	1.9	5.1	14	60	149	102	45	23	5.0
6	6.0	2.4	2.8	1.8	5.8	14	65	146	97	42	20	4.2
7	6.3	2.4	2.8	1.8	6.4	14	78	143	95	39	20	4.2
8	6.0	2.3	2.8	1.8	6.9	14	89	143	90	37	21	4.0
9	5.0	2.4	2.8	1.8	7.6	14	87	146	86	32	20	3.6
10	5.3	2.5	2.8	1.8	8.5	15	80	146	85	31	19	4.0
11	4.4	2.8	2.8	1.8	9.1	15	75	141	85	30	19	3.4
12	4.2	2.8	2.8	1.8	9.7	15	73	145	81	74	19	3.2
13	4.7	2.8	2.8	1.8	10	16	79	145	78	182	18	2.7
14	4.4	2.3	2.8	1.8	11	16	82	142	75	152	16	2.7
15	4.0	2.3	2.8	1.8	11	17	82	147	75	123	21	2.9
16	4.0	2.2	2.8	1.8	11	18	90	149	86	98	19	2.7
17	4.0	2.4	2.7	1.8	12	19	94	145	91	81	16	2.7
18	3.6	2.7	2.7	1.8	12	21	89	142	90	67	14	2.5
19	3.4	2.8	2.6	1.8	12	22	97	137	80	60	14	2.5
20	3.2	2.7	2.6	1.8	12	26	114	130	78	51	12	2.5
21	3.2	2.7	2.6	1.9	12	26	124	130	77	45	9.8	2.4
22	2.9	2.7	2.6	1.9	12	29	130	126	73	40	9.2	2.4
23	2.7	2.7	2.6	1.9	12	30	137	125	67	35	7.8	2.3
24	2.5	2.8	2.5	2.0	13	35	139	130	64	35	7.8	2.5
25	2.5	2.8	2.4	2.0	13	40	137	135	58	33	7.0	2.5
26	2.7	2.8	2.4	2.1	13	43	137	130	59	34	6.0	2.3
27	2.7	2.7	2.4	2.2	13	52	139	120	54	36	5.0	2.3
28	2.4	2.8	2.3	2.4	13	54	139	114	49	32	4.2	2.2
29	2.2	2.8	2.3	2.6	------	55	143	121	48	37	9.2	2.2
30	2.3	2.8	2.3	2.7	------	59	146	127	45	37	9.8	2.1
31	2.7	------	2.2	2.9	------	51	------	126	------	34	7.4	------
TOTAL	121.0	79.0	82.0	61.5	266.6	797	2,888	4,268	2,425	1,755	487.2	100.2
MEAN	3.90	2.63	2.65	1.98	9.52	25.7	96.3	138	80.8	56.6	15.7	3.34
MAX	6.3	2.8	2.8	2.9	13	59	146	149	124	182	31	6.6
MIN	2.2	2.2	2.2	1.8	3.2	13	38	114	45	30	4.2	2.1
CFSM	.022	.015	.015	.011	.053	.14	.54	.77	.45	.32	.088	.019
IN.	.03	.02	.02	.01	.06	.17	.60	.89	.50	.36	.10	.02

CAL YR 1969 TOTAL 29,806.8 MEAN 81.7 MAX 374 MIN 2.2 CFSM .46 IN 6.19
WTR YR 1970 TOTAL 13,330.5 MEAN 36.5 MAX 182 MIN 1.8 CFSM .20 IN 2.77

05279000 South Fork Crow River near Mayer, Minn.

LOCATION.--Lat 44°54'20", long 93°53'05", in SW¼SW¼ sec.30, T.117 N., R.25 W., Carver County, near center of span on downstream side of bridge on State Highway 7, 1.3 miles north of Mayer, 4.3 miles southwest of Watertown, and 16 miles upstream from confluence with North Fork.

DRAINAGE AREA.--1,170 sq mi, approximately.

PERIOD OF RECORD.--April 1934 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Nonrecording gage read once or twice daily. Datum of gage is 925.78 ft above mean sea level, datum of 1929 (levels by Minnesota Highway Department).

AVERAGE DISCHARGE.--36 years, 236 cfs (2.74 inches per year).

EXTREMES.--Current year: Maximum discharge, 1,400 cfs June 24 (gage height, 7.00 ft); minimum daily, 6.0 cfs Nov. 28; minimum gage height, 0.75 ft Oct. 2, 3.
Period of record: Maximum discharge, 16,100 cfs Apr. 13, 1965 (gage height, 19.23 ft, from floodmark); no flow at times.

REMARKS.--Records good except those for winter periods, which are fair.

REVISIONS (WATER YEARS).--WSP 1508: 1935-36.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	7.2	22	8.6	9.4	7.2	7.2	29	364	330	368	23	34
2	6.8	24	9.0	9.4	7.2	7.2	33	326	344	294	20	34
3	6.8	23	9.2	9.4	7.2	7.6	40	303	338	209	19	34
4	7.9	20	9.4	9.4	7.2	8.0	55	271	324	182	16	32
5	7.6	18	9.5	9.4	7.1	8.5	90	250	299	146	16	30
6	7.9	17	9.5	9.4	7.0	8.6	120	216	265	126	14	26
7	7.9	17	9.5	9.4	7.0	8.7	200	199	235	112	12	23
8	7.2	16	9.4	9.4	7.0	8.7	280	184	206	102	19	21
9	8.7	17	9.0	9.4	7.0	8.7	381	172	168	95	19	20
10	7.6	17	9.1	9.4	7.0	8.8	450	162	141	83	19	24
11	8.7	17	9.2	9.4	6.9	9.2	470	148	136	70	19	21
12	8.7	17	9.4	9.4	6.8	10	475	140	123	67	19	17
13	9.1	15	9.6	9.4	6.8	11	482	133	123	92	18	14
14	13	12	9.6	9.3	6.7	11	466	128	110	98	17	10
15	16	10	9.6	9.2	6.7	12	356	120	96	87	16	12
16	19	10	9.6	9.1	6.7	12	326	117	170	73	18	12
17	18	9.6	9.6	9.0	6.7	12	299	112	265	64	18	14
18	17	9.4	9.6	8.8	6.7	13	267	99	370	58	13	16
19	17	9.3	9.6	8.6	6.7	13	370	92	338	65	11	14
20	16	9.2	9.6	8.4	6.7	14	446	90	593	52	7.9	14
21	16	9.2	9.5	8.2	6.8	14	530	77	907	49	8.7	14
22	85	8.6	9.5	8.0	6.9	15	523	95	1,080	44	11	13
23	72	9.0	9.5	7.8	7.0	15	479	90	1,350	41	11	13
24	38	9.2	9.5	7.6	7.1	16	504	120	1,400	35	11	19
25	26	9.0	9.5	7.5	7.2	17	672	138	1,320	33	11	17
26	18	8.9	9.5	7.4	7.2	18	631	168	1,160	40	11	19
27	16	8.0	9.5	7.4	7.2	19	591	194	987	31	11	19
28	13	6.0	9.5	7.4	7.2	21	523	236	790	28	11	18
29	12	7.5	9.4	7.3	------	22	466	265	634	31	21	17
30	12	8.2	9.4	7.3	------	24	417	281	488	28	27	15
31	21	------	9.4	7.3	------	27	------	324	------	25	32	------
TOTAL	547.1	393.1	291.8	267.8	194.9	407.2	10,971	5,614	15,090	2,828	499.6	586
MEAN	17.6	13.1	9.41	8.64	6.96	13.1	366	181	503	91.2	16.1	19.5
MAX	85	24	9.6	9.4	7.2	27	672	364	1,400	368	32	34
MIN	6.8	6.0	8.6	7.3	6.7	7.2	29	77	96	25	7.9	10
CFSM	.015	.011	.008	.007	.006	.011	.31	.15	.43	.078	.014	.017
IN.	.02	.01	.009	.008	.006	.01	.35	.18	.48	.09	.02	.02

CAL YR 1969 TOTAL 185,859.1 MEAN 509 MAX 9,660 MIN 6.0 CFSM .44 IN 5.91
WTR YR 1970 TOTAL 37,690.5 MEAN 103 MAX 1,400 MIN 6.0 CFSM .08 IN 1.20

05280000 Crow River at Rockford, Minn.

LOCATION.--Lat 45°05'12", long 93°44'02", in sec.29, T.119 N., R.24 W., Hennepin County, on right bank at Rockford, 150 ft downstream from bridge on State Highway 55 and 1 mile downstream from confluence of North and South Forks.

DRAINAGE AREA.--2,520 sq mi, approximately.

PERIOD OF RECORD.--April to July 1906 (published as "near Dayton"), June 1909 to September 1917, April to November 1929, March 1930 to September 1931, April to November 1932, March to November 1933, March 1934 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 893.08 ft above mean sea level, datum of 1929. Apr. 13 to July 21, 1906, nonrecording gage at Berning Mill 14 miles downstream at different datum. June 4, 1909, to Sept. 30, 1917, nonrecording gage at site 600 ft downstream at different datum. Apr. 23, 1929, to Aug. 21, 1934, nonrecording gage at site 600 ft downstream at present datum.

AVERAGE DISCHARGE.--45 years (1909-17, 1930-31, 1934-70), 587 cfs (3.16 inches per year).

EXTREMES.--Current year: Maximum discharge, 1,820 cfs June 25 (gage height, 5.00 ft); minimum, 36 cfs Nov. 14 (gage height, 1.57 ft).
Period of record: Maximum discharge, 22,400 cfs Apr. 16, 1965 (gage height, 19.27 ft, from floodmark); minimum, 1,8 cfs Nov. 15, 1936 (gage height, 1.05 ft), caused by ice jam upstream.

REMARKS.--Records good except those for winter period, which are fair. Records of chemical analyses for the water year 1970 are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 1115: 1932. WSP 1508: 1933.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	58	92	74	72	82	77	167	1,240	819	917	203	109
2	57	94	73	72	82	77	183	1,190	847	854	192	106
3	56	96	72	72	82	86	200	1,150	840	751	181	109
4	56	98	70	72	82	90	220	1,100	819	672	172	104
5	56	94	67	72	82	90	254	1,040	777	653	164	96
6	57	94	63	72	83	90	289	995	724	604	153	88
7	58	92	60	72	83	90	346	938	653	550	146	82
8	58	92	58	73	83	92	622	896	586	509	148	74
9	60	90	56	73	84	94	833	854	526	460	146	74
10	58	88	56	73	84	95	896	826	487	425	141	74
11	58	88	56	74	85	98	931	784	455	388	143	69
12	61	86	57	74	86	100	910	744	440	366	126	68
13	71	74	58	74	87	103	931	712	550	362	124	68
14	71	56	60	75	86	104	917	679	562	392	120	66
15	68	66	62	76	86	104	889	653	592	445	124	76
16	74	69	64	76	85	105	819	634	718	509	120	78
17	76	82	66	77	85	109	770	616	903	538	113	78
18	78	84	70	77	85	112	751	586	1,080	538	109	80
19	80	66	72	78	85	113	819	544	1,170	520	109	80
20	80	63	73	78	84	115	1,010	514	1,260	465	104	80
21	78	73	74	78	84	116	1,170	482	1,380	410	104	78
22	78	78	74	79	83	119	1,230	487	1,540	370	96	73
23	189	80	75	79	82	120	1,340	487	1,680	338	90	71
24	138	84	76	80	80	122	1,420	492	1,780	306	86	80
25	111	86	76	80	80	124	1,480	509	1,810	276	82	86
26	98	90	76	81	78	124	1,480	532	1,770	257	80	90
27	90	86	76	81	77	134	1,450	574	1,640	248	78	84
28	84	75	76	82	77	138	1,400	628	1,450	235	69	84
29	80	72	75	82	------	146	1,340	679	1,250	226	88	84
30	80	72	74	82	------	156	1,270	712	1,070	220	92	80
31	88	------	72	82	------	162	------	777	------	215	111	------
TOTAL	2,405	2,460	2,111	2,368	2,322	3,405	26,337	23,054	30,178	14,019	3,814	2,469
MEAN	77.6	82.0	68.1	76.4	82.9	110	878	744	1,006	452	123	82.3
MAX	189	98	76	82	87	162	1,480	1,240	1,810	917	203	109
MIN	56	56	56	72	77	77	167	482	440	215	69	66
CFSM	.031	.033	.027	.030	.033	.044	.35	.30	.40	.18	.049	.033
IN.	.04	.04	.03	.03	.03	.05	.39	.34	.45	.21	.06	.04

CAL YR 1969 TOTAL 442,664 MEAN 1,213 MAX 15,000 MIN 56 CFSM .48 IN 6.53
WTR YR 1970 TOTAL 114,942 MEAN 315 MAX 1,810 MIN 56 CFSM .13 IN 1.70

05284000 Mille Lacs Lake at Garrison, Minn.

LOCATION.--Lat 46°18'05", long 93°49'05", in SW¼SE¼ sec.12, T.44 N., R.28 W., Crow Wing County, at pumphouse of Minnesota Division of Game and Fish, 0.2 mile southwest of Borden Lake Outlet and 0.8 mile northeast of Garrison.

PERIOD OF RECORD.--June 1931 to current year. Prior to October 1939, published as "at Wealthwood."

GAGE.--Water-stage recorder. Datum of gage is 1,240.40 ft above mean sea level, datum of 1929. Prior to Oct. 1, 1941, nonrecording gage at Wealthwood at various datums; gage readings have been reduced to elevations above mean sea level, adjustment of 1912. Oct. 1, 1941, to Sept. 30, 1958, water-stage recorder at datum 1,240.50 ft above mean sea level, adjustment of 1912. To convert these records to datum of 1929, subtract 0.10 ft.

EXTREMES.--Current year: Maximum elevation, 1,252.20 ft June 12 (affected by wind action); maximum daily, 1,251.89 ft June 12; minimum, 1,250.53 ft Oct. 25 (affected by wind action).
Period of record: Maximum elevation, 1,253.51 ft July 25, 1952; minimum observed, 1,245.74 ft Oct. 16-19, 1936.

REMARKS.--Water level affected by fixed-crest spillway at outlet of Ogechie Lake with crest at elevation 1,250.50 ft. Water level subject to fluctuation caused by change in direction and velocity of wind and by seiches.

MONTHEND ELEVATION, IN FEET, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Oct. 31	1,250.79	Feb. 28	1,250.90	June 30	1,251.83
Nov. 21	1,250.81	Mar. 31	1,251.02	July 31	1,251.49
Dec. 31	1,250.93	Apr. 30	1,251.52	Aug. 31	1,251.08
Jan. 31	1,250.90	May 31	1,251.76	Sept.30	1,250.77

NOTE.--Elevations other than those shown are available.

05286000 Rum River near St. Francis, Minn.

LOCATION.--Lat 45°19'40", long 93°22'20", in SE¼ sec.19, T.33 N., R.24 W., Anoka County, on left bank at upstream side of highway bridge, 4 miles south of St. Francis and 15.5 miles upstream from mouth.

DRAINAGE AREA.--1,360 sq mi, approximately.

PERIOD OF RECORD.--May to November 1929, March 1930 to September 1931, April to November 1932, March 1933 to current year.

GAGE.--Water-stage recorder. Datum of gage is 860.74 ft above mean sea level, datum of 1929 (levels by Anoka County Highway Department). Prior to Nov. 9, 1933, nonrecording gage at site 50 ft downstream at same datum.

AVERAGE DISCHARGE.--38 years (1930-31, 1933-70), 560 cfs (5.59 inches per year).

EXTREMES.--Current year: Maximum discharge, 3,230 cfs Apr. 30 (gage height, 6.39 ft); minimum daily, 160 cfs Feb. 2-18, Feb. 27 to Mar. 2; minimum gage height, 2.37 ft on Sept. 14.
Period of record: Maximum discharge, 10,100 cfs Apr. 20, 1965, Apr. 13, 1969; maximum gage height 11.63 ft Apr. 13, 1969; minimum discharge, 29 cfs Aug. 18, 1934 (gage height, 1.91 ft).

REMARKS.--Records good except those for winter periods, which are fair. Records of chemical analyses for the current year are published in Part 2 of this report. Occasional regulation by Ogechie (also controls Mille Lacs Lake) and Onamia Lakes.

REVISIONS (WATER YEARS).--WSP 1308: 1930(M), 1932(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	216	223	190	180	162	160	240	3,030	635	459	277	185
2	212	230	190	180	160	160	255	2,690	647	450	277	181
3	216	233	190	178	160	170	270	2,320	672	420	266	181
4	212	233	190	176	160	175	300	1,950	697	400	256	181
5	212	233	190	176	160	175	360	1,600	704	388	252	175
6	212	233	190	174	160	175	441	1,320	672	380	245	185
7	216	233	188	172	160	170	523	1,110	629	373	249	198
8	216	230	188	172	160	170	704	973	574	361	256	188
9	216	226	188	170	160	170	896	861	528	342	256	178
10	216	223	186	170	160	170	1,030	782	497	335	252	181
11	212	219	186	168	160	170	1,210	717	473	323	259	178
12	216	216	186	168	160	170	1,440	666	459	320	256	175
13	223	209	186	168	160	170	1,680	635	468	316	245	175
14	219	206	184	168	160	170	1,820	598	473	327	235	172
15	223	189	184	166	160	170	1,850	586	503	309	259	191
16	230	188	182	166	160	170	1,670	569	782	312	252	198
17	233	186	182	166	160	168	1,410	551	1,080	342	242	198
18	230	190	180	166	160	166	1,160	540	1,190	331	235	201
19	226	170	180	164	161	162	1,050	534	1,090	335	228	201
20	226	190	180	164	162	160	1,100	513	995	312	218	198
21	230	194	180	162	163	164	1,170	497	896	312	214	195
22	226	194	180	162	167	166	1,270	563	808	305	211	195
23	219	194	180	162	167	170	1,490	557	730	294	218	188
24	216	194	180	162	163	175	1,800	586	660	284	208	188
25	216	192	180	162	162	178	2,110	598	598	270	201	195
26	216	192	180	162	161	180	2,390	598	563	263	198	201
27	212	192	180	162	160	182	2,690	604	540	284	191	204
28	208	192	180	162	160	186	2,970	604	518	291	188	204
29	202	192	180	162	------	190	3,180	610	503	298	201	198
30	202	192	180	162	------	210	3,180	623	482	287	195	191
31	216	------	180	162	------	225	------	629	------	284	188	------
TOTAL	6,745	6,188	5,700	5,194	4,508	5,397	41,659	29,014	20,066	10,307	7,228	5,679
MEAN	218	206	184	168	161	174	1,389	936	669	332	233	189
MAX	233	233	190	180	167	225	3,180	3,030	1,190	459	277	204
MIN	202	170	180	162	160	160	240	497	459	263	188	172
CFSM	.16	.15	.14	.12	.12	.13	1.02	.69	.49	.24	.17	.14
IN.	.18	.17	.16	.14	.12	.15	1.14	.79	.55	.28	.20	.16

CAL YR 1969 TOTAL 287,451 MEAN 788 MAX 10,000 MIN 170 CFSM .58 IN 7.86
WTR YR 1970 TOTAL 147,685 MEAN 405 MAX 3,180 MIN 160 CFSM .30 IN 4.04

05288500 Mississippi River near Anoka, Minn.

LOCATION.-- Lat 45°07'36", long 93°17'48", in SW¼ sec.12, T.119 N., R.21 W., Hennepin County, on right bank 0.5 mile downstream from Coon Creek, 1.5 miles downstream from hydroelectric plant of Northern States Power Co. at Coon Rapids, 6.5 miles downstream from Anoka, and at mile 864.8 upstream from Ohio River.

DRAINAGE AREA.--19,100 sq mi, approximately.

PERIOD OF RECORD.--June 1931 to current year. Prior to October 1931 published as "at Coon Rapids, near Anoka."

GAGE.--Water-stage recorder. Datum of gage is 805.02 ft above mean sea level, adjustment of 1912. Prior to June 14, 1932, at site 1.2 miles upstream at different datum.

AVERAGE DISCHARGE.--39 years, 7,142 cfs (5.08 inches per year).

EXTREMES.--Current year: Maximum discharge, 25,800 cfs Apr. 30 (gage height, 8.55 ft); minimum, 980 cfs Sept. 9 (gage height, .64 ft).
Period of record: Maximum discharge, 91,000 cfs Apr. 17, 1965 (gage height, 19.53 ft); minimum, 586 cfs Sept. 13, 1934 (gage height, 0.37 ft); minimum gage height 0.13 ft Nov. 28, 1967.

REMARKS.--Records good. Flow slightly regulated by six reservoirs on headwaters; total usable capacity, 1,640,600 acre-ft. Diurnal regulation caused by dam above station. Coon Rapids hydroelectric plant discontinued operation Dec. 31, 1968.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3,650	5,240	4,500	4,600	4,500	4,250	5,850	25,400	11,700	8,460	3,170	1,810
2	3,670	5,230	5,100	4,700	4,450	4,300	6,040	25,500	11,900	8,370	3,000	1,780
3	2,930	5,040	5,000	4,750	4,450	4,400	6,590	25,100	12,100	7,980	2,740	1,780
4	3,350	5,010	4,650	4,800	4,400	4,450	6,790	24,500	12,000	6,620	2,550	1,780
5	3,720	4,990	4,400	4,750	4,400	4,500	6,810	23,500	12,200	6,210	2,650	1,710
6	4,280	5,070	4,650	4,700	4,350	4,500	6,640	21,900	11,300	6,540	2,580	1,830
7	3,410	5,160	4,550	4,600	4,400	4,550	7,540	20,900	11,000	6,060	2,700	1,790
8	4,260	5,500	4,350	4,550	4,450	4,550	10,300	20,600	10,400	6,060	2,710	1,750
9	5,150	5,510	4,350	4,500	4,450	4,550	11,700	20,000	9,830	6,020	2,250	1,480
10	4,820	5,220	4,200	4,500	4,500	4,550	13,500	18,900	9,610	5,920	2,200	1,790
11	4,720	5,240	4,350	4,550	4,550	4,600	15,100	18,000	9,420	5,380	2,560	1,830
12	4,910	5,290	4,100	4,600	4,500	4,700	16,800	17,600	9,060	5,310	2,680	1,780
13	4,950	5,690	4,300	4,650	4,500	4,700	18,600	16,800	9,890	5,140	2,460	1,720
14	4,910	5,900	4,600	4,700	4,400	4,550	18,600	15,600	9,300	4,600	2,460	1,700
15	4,780	6,280	4,050	4,700	4,300	4,350	18,300	15,400	9,130	4,280	2,550	1,900
16	4,960	4,400	3,600	4,750	4,250	4,450	17,900	15,500	10,600	4,170	2,130	1,850
17	4,610	4,040	3,500	4,800	4,200	4,700	16,800	13,200	11,300	4,280	1,800	1,780
18	4,830	4,700	3,950	4,750	4,200	5,300	16,000	13,500	11,800	4,260	2,100	1,830
19	4,930	4,650	4,100	4,700	4,150	5,100	15,500	13,500	12,100	4,000	2,040	1,770
20	4,640	4,050	4,250	4,600	4,100	4,650	17,000	13,100	12,000	4,220	1,910	1,830
21	4,920	3,600	4,350	4,550	4,050	4,700	17,900	11,500	12,000	4,090	1,870	1,870
22	4,550	3,800	4,400	4,500	4,000	4,800	17,700	12,700	11,900	3,520	1,780	2,040
23	4,580	3,900	4,250	4,450	4,000	4,950	19,000	11,200	11,500	3,670	1,830	2,290
24	4,680	4,000	4,050	4,400	4,050	5,100	19,800	10,800	11,100	4,030	1,830	1,950
25	4,660	4,350	4,050	4,400	4,100	5,300	20,900	11,400	10,700	3,910	1,830	2,020
26	4,610	4,700	4,200	4,400	4,150	5,400	22,000	10,900	10,300	3,840	1,800	1,850
27	4,590	4,600	4,250	4,400	4,200	5,450	22,900	10,300	10,300	4,030	1,770	1,610
28	4,540	4,350	4,250	4,450	4,200	5,600	24,300	11,300	9,770	3,930	1,680	1,670
29	4,530	4,550	4,450	4,450	------	5,700	24,900	10,800	9,450	3,960	2,010	1,960
30	4,390	4,400	4,450	4,500	------	5,800	25,500	11,400	9,320	3,250	1,920	1,890
31	4,470	------	4,700	4,500	------	5,800	------	11,700	------	3,230	1,810	------
TOTAL	137,990	144,460	133,950	142,250	120,250	150,300	467,260	502,500	322,980	155,340	69,370	54,590
MEAN	4,451	4,815	4,321	4,589	4,295	4,848	15,580	16,210	10,770	5,011	2,238	1,820
MAX	5,150	6,280	5,100	4,800	4,550	5,800	25,500	25,500	12,200	8,460	3,170	2,290
MIN	2,930	3,600	3,500	4,400	4,000	4,250	5,850	10,300	9,060	3,230	1,680	1,480
CFSM	.23	.25	.23	.24	.22	.25	.82	.85	.56	.26	.12	.10
IN.	.27	.28	.26	.28	.23	.29	.91	.98	.63	.30	.14	.11

CAL YR 1969 TOTAL 3,652,690 MEAN 10,010 MAX 72,300 MIN 2,220 CFSM .52 IN 7.11
WTR YR 1970 TOTAL 2,401,240 MEAN 6,579 MAX 25,500 MIN 1,480 CFSM .34 IN 4.68

05290000 Little Minnesota River near Peever, S. Dak.

LOCATION.--Lat 45°36'05", long 96°52'18", in SW¼ sec. 13, T.125 N., R.50 W., Roberts County, on right bank 2 miles northwest of town of Browns Valley, Minn., 3.2 miles upstream from proposed Lake Traverse diversion, 5.3 miles northeast of Peever, 7.2 miles downstream from Jorgenson River, and 8 miles upstream from Big Stone Lake.

DRAINAGE AREA.--447 sq mi.

PERIOD OF RECORD.--October 1939 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,000 ft (from topographic map). Oct. 1, 1939, to Mar. 20, 1940, nonrecording gage at site 4.5 miles downstream at different datum. Mar. 21 to Apr. 12, 1940, nonrecording gage at site 100 ft downstream at present datum. April 13 to Aug. 27, 1940, nonrecording gage at present site and datum.

AVERAGE DISCHARGE.--31 years, 46.3 cfs (1.41 inches per year, 33,540 acre-ft per year).

EXTREMES.--Current year: Maximum discharge 371 cfs Apr. 7 (gage height, 4.49 ft); minimum, 0.06 cfs Aug. 23, Sept. 14; minimum gage height, 1.96 ft July 25, 26.
Period of record: Maximum discharge, 4,730 cfs Apr. 8, 1952 (gage height, 12.16 ft); maximum gage height, 13.35 ft Mar. 25, 1943, from floodmark (backwater from ice); no flow at times in 1940, 1942, 1950, 1954, 1957, 1959, 1963, 1968.

REMARKS.--Records good except those for winter period, which are fair.

REVISIONS (WATER YEARS).--WSP 1308: 1943(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.33	1.1	.76	.72	.71	.74	14	132	16	8.9	2.4	1.1
2	.33	1.0	.76	.72	.71	.73	15	109	23	7.4	3.1	1.1
3	.36	.96	.76	.72	.71	25	15	95	19	6.2	2.6	.71
4	.50	.84	.76	.72	.71	60	16	77	14	5.0	2.8	.37
5	.98	.79	.76	.72	.71	80	22	66	14	4.4	1.9	.24
6	.76	.76	.76	.72	.71	65	70	58	17	3.7	1.2	.25
7	.64	.76	.76	.72	.71	50	228	53	17	3.2	.91	.23
8	.59	.76	.76	.72	.71	40	140	48	13	2.5	.85	.23
9	.54	.76	.76	.72	.71	34	127	43	10	1.9	.71	.20
10	.50	1.4	.75	.72	.71	29	82	39	8.5	1.5	.57	.22
11	.59	.79	.75	.72	.71	25	70	35	7.5	1.1	.51	.18
12	.64	.67	.75	.72	.71	22	61	32	6.5	1.1	.44	.11
13	.76	.67	.75	.72	.71	20	55	30	6.5	1.4	.40	.09
14	.70	.66	.75	.72	.71	17	44	29	5.9	1.1	.32	.10
15	.70	.70	.74	.72	.71	16	42	29	34	1.0	.31	.17
16	.70	.71	.74	.72	.71	15	54	28	37	.79	.28	.14
17	.70	.78	.74	.72	.71	15	62	27	53	.60	.24	.15
18	.70	.80	.74	.72	.71	14	63	24	43	.51	.22	.24
19	.70	.71	.74	.72	.71	14	69	21	34	.43	.20	.27
20	.70	.74	.74	.71	.71	14	92	19	33	.43	.16	.28
21	.64	.74	.73	.71	.72	14	119	16	48	.40	.13	.27
22	.59	.74	.73	.71	.74	14	121	15	49	.33	.08	.26
23	.59	.75	.73	.71	.76	14	130	15	36	.29	.08	.28
24	.62	.75	.73	.71	.78	15	145	15	29	.27	.10	.32
25	.63	.76	.72	.71	.80	16	153	16	25	.25	.17	.35
26	.64	.76	.72	.71	.82	15	166	17	23	6.4	.28	.30
27	.64	.76	.72	.71	.78	15	169	16	20	6.5	.48	.34
28	.64	.76	.72	.71	.75	15	263	14	16	3.9	.71	.34
29	.66	.76	.72	.71	------	14	238	14	13	2.6	1.1	.32
30	.73	.76	.72	.71	------	14	174	14	11	2.3	1.2	.29
31	.89	------	.72	.71	------	14	------	15	------	2.5	1.2	------
TOTAL	19.69	23.90	22.99	22.20	20.35	716.47	3,019	1,161	681.9	78.90	25.65	9.45
MEAN	.64	.80	.74	.72	.73	23.1	101	37.5	22.7	2.55	.83	.32
MAX	.98	1.4	.76	.72	.82	80	263	132	53	8.9	3.1	1.1
MIN	.33	.66	.72	.71	.71	.73	14	14	5.9	.25	.08	.09
CFSM	.001	.002	.002	.002	.002	.05	.23	.08	.05	.006	.002	.0007
IN.	.002	.002	.002	.002	.002	.06	.25	.10	.06	.007	.002	.0007
AC-FT	39	47	46	44	40	1,420	5,990	2,300	1,350	156	51	19

CAL YR 1969 TOTAL 33,254.78 MEAN 91.1 MAX 2,910 MIN .30 CFSM .20 IN 2.77 AC-FT 65,960
WTR YR 1970: TOTAL 5,801.50 MEAN 15.9 MAX 263 MIN .08 CFSM .04 IN .48 AC-FT 11,510

PEAK DISCHARGE (BASE, 450 CFS).--No peak above base.

05291000 Whetstone River near Big Stone City, S. Dak.

LOCATION.--Lat 45°17'32", long 96°29'14", in SE¼NW¼ sec.18, T.121 N., R.46 W., Grant County, on right bank 20 ft downstream from highway bridge, 1.5 miles west of Big Stone City, and 4.5 miles upstream from Big Stone Lake.

DRAINAGE AREA.--389 sq mi.

PERIOD OF RECORD.--March 1910 to November 1912 (no winter records) and March 1931 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 996.96 ft above mean sea level, adjustment of 1912. Mar. 8 1910, to Nov. 30, 1912, nonrecording gage 2 miles downstream at different datum. Mar. 18, 1931, to May 3, 1939, nonrecording gage, at site 20 ft upstream at present datum. May 4, 1939, to Nov. 8, 1952, water-stage recorder at site 80 ft downstream at present datum.

AVERAGE DISCHARGE.--39 years (1931-70), 45.5 cfs (1.59 inches per year, 32,960 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, about 1,500 cfs Mar. 5 (gage height, about 7.6 ft; minimum daily, 1.8 cfs Aug. 27, 28.

Period of record: Maximum discharge, 6,870 cfs Apr. 8, 1969 (gage height, 14.32 ft, from floodmark); no flow at times in most years.

Maximum stage known, about 26 ft in June 1919, present site and datum, from information by local resident.

REMARKS.--Records good except those for winter periods, which are fair.

REVISIONS (WATER YEARS).--WSP 895: Drainage area. WSP 1308: 1932(M), 1935(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	3.9	12	5.1	5.7	4.3	4.8	32	79	47	11	4.7	6.3
2	2.6	12	4.9	5.7	4.3	6.0	32	70	40	11	3.9	5.9
3	2.4	10	4.9	5.7	4.3	50	32	61	34	11	3.9	5.0
4	3.2	9.0	5.0	5.6	4.3	600	33	56	27	9.8	3.6	4.4
5	13	10	5.1	5.6	4.3	1,300	36	49	22	8.9	3.6	4.1
6	20	7.7	5.2	5.6	4.3	740	100	43	19	7.5	3.4	3.6
7	12	7.3	5.2	5.5	4.3	420	428	40	15	6.6	4.4	3.1
8	8.3	6.8	5.3	5.5	4.3	260	236	38	14	5.9	5.9	3.4
9	6.7	6.5	5.4	5.5	4.3	160	209	35	12	5.6	5.9	2.2
10	5.8	6.4	5.4	5.5	4.3	110	137	31	9.8	5.3	4.7	3.4
11	5.5	6.0	5.4	5.4	4.4	87	91	33	9.4	5.3	4.4	3.1
12	5.2	5.6	5.4	5.4	4.4	56	74	32	10	5.0	4.1	2.6
13	5.5	5.4	5.4	5.4	4.4	43	67	30	28	4.7	3.9	2.9
14	5.8	5.2	5.4	5.4	4.4	35	59	27	28	4.7	3.4	3.6
15	5.2	4.9	5.4	5.4	4.4	33	59	28	30	4.4	2.6	4.7
16	4.9	5.1	5.5	5.3	4.4	33	75	27	57	4.1	2.6	4.4
17	4.9	5.4	5.5	5.2	4.4	33	111	26	175	3.9	2.4	4.7
18	4.6	5.4	5.5	5.1	4.5	32	145	24	182	3.6	2.6	3.9
19	4.6	5.4	5.5	5.0	4.5	32	157	21	120	3.6	2.4	3.4
20	4.9	5.4	5.5	4.8	4.5	32	214	19	79	3.4	2.4	3.4
21	5.2	5.4	5.6	4.6	4.5	32	428	19	59	3.4	2.1	2.9
22	3.7	5.4	5.6	4.4	4.5	32	319	21	51	3.1	1.9	2.9
23	5.5	5.4	5.6	4.4	4.5	32	243	22	41	2.9	2.1	2.6
24	4.2	5.4	5.6	4.3	4.6	33	202	25	33	2.9	2.6	2.6
25	4.0	5.3	5.6	4.3	4.6	34	252	25	27	2.9	2.2	2.6
26	3.9	5.2	5.7	4.3	4.6	34	217	25	23	2.6	1.9	2.6
27	3.8	5.1	5.7	4.3	4.7	33	161	22	19	4.1	1.8	2.4
28	3.9	5.0	5.8	4.3	4.7	33	128	23	15	12	1.8	2.4
29	4.0	6.0	5.8	4.3	------	33	109	27	13	9.4	5.9	2.2
30	4.4	5.1	5.7	4.3	------	32	93	33	12	7.1	5.3	2.4
31	7.3	------	5.7	4.3	------	32	------	45	------	5.9	4.4	------
TOTAL	178.9	194.8	168.4	156.1	124.0	4,426.8	4,479	1,056	1,251.2	181.6	106.8	103.7
MEAN	5.77	6.49	5.43	5.04	4.43	143	149	34.1	41.7	5.86	3.45	3.46
MAX	20	12	5.8	5.7	4.7	1,300	428	79	182	12	5.9	6.3
MIN	2.4	4.9	4.9	4.3	4.3	4.8	32	19	9.4	2.6	1.8	2.2
CFSM	.01	.02	.01	.01	.01	.37	.38	.09	.11	.02	.009	.009
IN.	.02	.02	.02	.01	.01	.42	.43	.10	.12	.02	.01	.01
AC-FT	355	386	334	310	246	8,780	8,880	2,090	2,480	360	212	206

CAL YR 1969 TOTAL 37,873.7 MEAN 104 MAX 6,090 MIN 1.6 CFSM .27 IN 3.62 AC-FT 75,120
WTR YR 1970: TOTAL 12,427.3 MEAN 34.0 MAX 1,300 MIN 1.8 CFSM .09 IN 1.19 AC-FT 24,650

PEAK DISCHARGE (BASE, 200 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
	about	about	about				
3-4	0800	7.6	1,500	4-21	1200	4.90	465
4-7	0700	5.28	564				

05291500 Big Stone Lake at Ortonville, Minn.

LOCATION.--Lat 45°18'18, long 96°26'57", in NW¼SW¼ sec.9, T.121 N., R.46 W., Big Stone County, at powerplant intake at west edge of Ortonville, 0.5 mile north of concrete dam at outlet, 0.5 mile southwest of Ortonville.

PERIOD OF RECORD.--March 1937 to current year.

GAGE.--Nonrecording gage read once a day. Datum of gage is 957.69 ft above mean sea level, datum of 1929. Prior to Sept. 17, 1947, nonrecording gage at site 0.5 mile south at same datum. Sept. 18, 1947, to June 30, 1963, water-stage recorder at site 0.5 mile south at same datum. Sept. 21, 1959, to June 30, 1963, supplementary nonrecording gage read once daily, at present site and datum.

EXTREMES.--Current year: Maximum gage height observed, 8.48 ft May 1; minimum observed, 5.69 ft Oct. 23.
Period of record: Maximum gage height, 12.73 ft Apr. 17, 1952; minimum observed, 3.53 ft Mar. 2, 1957 (strong upstream wind in channel). Minimum observations of 3.10 ft Mar. 2, 1940 and 2.20 ft Nov. 20, 1940 at spillway site are the result of blockage of channel to spillway by ice and snow and do not represent lake elevations.

REMARKS.--Reservoir is formed by natural lake with concrete dam at outlet. Fixed crest of dam is at elevation 963.64 ft, with one 5-foot and two 2.5-foot gates with lowest sill at elevation 958.40 ft (all elevations are referred to datum of 1929). Changes in gate openings are not made.
Silt barrier dam 700 ft upstream in outlet channel of lake completed July 7, 1958; crest elevation, 963.6 ft. Supplementary nonrecording gage readings used for stages below crest of silt barrier to June 30, 1963. Water level subject to fluctuation caused by wind action.

GAGE HEIGHT, IN FEET, OCTOBER 1969 TO SEPTEMBER 1970

Oct. 31	5.92	Feb. 28	6.25	June 30	7.31
Nov. 30	6.04	Mar. 31	6.97	July 31	7.08
Dec. 31	6.22	Apr. 30	8.24	Aug. 31	6.40
Jan. 31	6.22	May 31	7.82	Sept. 30	6.12

NOTE.--Gage-height record other than that shown above is available.

05292000 Minnesota River at Ortonville, Minn.

LOCATION.--Lat 45°17'44", long 96°26'38", in NE¼NW¼ sec.16, T.121 N., R.46 W., Big Stone County, on left bank 400 ft downstream from bridge on U.S. Highway 12 and 1,300 ft downstream from dam at outlet of Big Stone Lake, at Ortonville.

DRAINAGE AREA.--1,160 sq mi, approximately.

PERIOD OF RECORD.--February 1938 to current year.

GAGE.--Water-stage recorder. Datum of gage is 956.38 ft above mean sea level, datum of 1929. Prior to Mar. 31, 1939, nonrecording gage on downstream side of dam 1,300 ft upstream at datum 1.31 ft higher.

AVERAGE DISCHARGE.--32 years, 113 cfs (81,870 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 394 cfs May 1 (gage height, 5.38 ft); minimum, 4.5 cfs Nov. 16, Dec. 5 (gage height, 1.26 ft); minimum gage height, 1.26 ft Nov. 16, Dec. 5.
Period of record: Maximum discharge, 3,060 cfs Apr. 13, 1952 (gage height, 12.92 ft); no flow Dec. 13, 1940.

REMARKS.--Records good except those for winter periods, which are fair. Flow affected by natural storage in Big Stone Lake (see preceding page).

REVISIONS (WATER YEARS).--WSP 895: 1939. WSP 1508: 1942 (yearly mean).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	14	15	5.4	11	12	14	14	320	124	47	36	26
2	12	14	5.9	11	12	14	15	213	81	53	34	27
3	7.7	9.8	5.9	11	12	18	15	237	70	104	34	28
4	20	8.4	5.4	11	12	22	15	216	79	45	32	27
5	26	7.7	5.4	11	12	35	21	213	77	37	32	26
6	21	9.8	5.9	11	12	32	24	126	69	38	31	27
7	27	8.4	6.4	11	12	31	29	158	64	47	31	29
8	18	7.1	6.4	11	12	31	29	160	47	39	32	23
9	20	9.1	6.5	11	12	31	25	161	41	36	32	24
10	20	9.8	6.6	11	12	30	24	151	46	36	32	22
11	24	15	6.6	11	12	30	26	130	53	36	35	20
12	18	12	6.6	11	12	31	32	143	38	36	34	21
13	21	20	6.7	11	12	31	43	141	47	36	34	18
14	15	20	6.6	11	12	31	42	144	46	38	34	18
15	17	8.4	6.6	12	12	31	33	193	67	47	34	18
16	22	5.9	6.6	12	12	31	118	143	74	33	32	17
17	17	14	6.6	12	12	31	62	100	92	34	31	15
18	14	14	6.8	12	13	32	39	123	121	34	31	15
19	12	5.9	6.7	12	13	33	63	104	58	35	32	15
20	15	5.4	6.6	12	13	33	127	104	80	32	30	15
21	20	5.4	6.7	12	13	32	161	127	69	31	28	17
22	7.7	5.4	7.1	12	13	32	169	98	58	31	30	15
23	5.9	5.4	7.7	11	14	33	179	87	63	31	29	15
24	7.7	5.4	8.7	12	14	32	193	104	77	32	29	15
25	15	5.9	9.2	12	14	24	201	182	64	32	28	16
26	18	5.4	9.4	12	14	13	218	94	71	53	28	15
27	12	5.0	9.4	12	14	13	227	58	44	38	29	15
28	6.4	5.4	9.6	12	14	13	206	58	45	38	27	16
29	5.9	5.4	10	12	------	13	261	91	46	38	29	15
30	6.4	5.4	10	12	------	13	287	80	42	39	29	15
31	9.8	------	10	12	------	14	------	116	------	39	27	------
TOTAL	475.5	273.8	224.0	357	353	804	2,898	4,375	1,953	1,245	966	585
MEAN	15.3	9.13	7.23	11.5	12.6	25.9	96.6	141	65.1	40.2	31.2	19.5
MAX	27	20	10	12	14	35	287	320	124	104	36	29
MIN	5.9	5.0	5.4	11	12	13	14	58	38	31	27	15
AC-FT	943	543	444	708	700	1,590	5,750	8,680	3,870	2,470	1,920	1,160

CAL YR 1969 TOTAL 88,807.3 MEAN 243 MAX 2,540 MIN 5.0 ACFT 176,100
WAT YR 1970 TOTAL 14,509.3 MEAN 39.8 MAX 320 MIN 5.0 ACFT 28,780

05293000 Yellow Bank River near Odessa, Minn.

LOCATION.--Lat 45°13'35", long 96°21'12", in SE¼SE¼ sec.1, T. 120 N., R.46 W., Lac qui Parle County, on left bank 150 ft downstream from highway bridge, 2.5 miles southwest of Odessa, and 4.5 miles upstream from mouth.

DRAINAGE AREA.--398 sq mi.

PERIOD OF RECORD.--October 1939 to current year.

GAGE.--Water-stage recorder. Datum of gage is 953.34 ft above mean sea level, datum of 1929 (Corps of Engineers bench mark). Prior to Aug. 28, 1940, nonrecording gage at site 150 ft upstream at same datum.

AVERAGE DISCHARGE.--31 years, 56.6 cfs (1.93 inches per year, 41,000 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 828 cfs Apr. 21 (gage height, 6.14 ft; minimum, 1.0 cfs Aug. 27, 28; minimum gage height, 1.60 ft Aug. 26, 27, 28.
Period of record: Maximum discharge, 6,970 cfs Apr. 9, 1969 (gage height, 19.07 from floodmark); no flow Jan. 26 to Feb. 8, 1940, Jan. 8, 9, 1942, Jan. 25 to Feb. 25, 1959, Feb. 11 to Mar. 9, 1965.

REMARKS.--Records good except those for period for winter periods, which are fair.

REVISIONS (WATER YEARS).--WSP 1388: 1947(M), 1950.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2.6	10	5.8	6.3	4.5	5.5	58	150	157	37	4.4	2.1
2	2.5	12	7.0	6.4	4.5	15	56	135	154	37	4.2	1.8
3	2.4	11	8.5	6.3	4.5	80	55	121	144	29	4.1	1.8
4	2.7	13	7.8	6.2	4.5	120	54	111	119	25	4.0	1.6
5	7.1	13	6.0	6.2	4.5	140	54	101	100	22	3.7	1.3
6	13	13	6.2	6.1	4.5	250	90	94	85	21	3.7	1.1
7	11	12	6.5	6.0	4.4	230	135	87	74	19	4.0	1.1
8	6.5	11	7.1	6.0	4.4	200	198	82	64	16	4.2	1.2
9	7.7	10	7.6	5.9	4.4	170	196	77	56	15	4.1	1.2
10	8.9	10	6.4	5.8	4.4	145	161	72	49	13	4.5	1.4
11	7.0	9.4	6.2	5.8	4.4	120	128	68	44	12	3.8	1.2
12	5.6	12	6.2	5.7	4.4	145	114	65	40	11	3.1	1.1
13	5.8	9.0	6.2	5.6	4.3	90	108	61	81	11	2.9	1.1
14	5.7	9.0	6.2	5.5	4.3	70	99	59	71	11	3.0	1.4
15	5.4	8.6	6.2	5.4	4.3	50	102	58	90	11	2.3	1.7
16	5.4	7.7	6.2	5.4	4.3	45	107	56	185	8.9	2.1	1.7
17	5.1	7.4	6.2	5.3	4.3	43	127	55	219	8.3	2.1	2.1
18	5.0	7.2	6.2	5.2	4.4	43	216	53	355	7.3	2.2	1.9
19	5.4	7.0	6.2	5.0	4.4	45	235	50	276	7.3	2.2	1.7
20	5.4	6.8	6.2	4.8	4.4	48	271	47	205	6.9	1.9	1.5
21	5.5	6.7	6.2	4.6	4.5	52	658	44	160	6.3	1.7	1.4
22	5.0	6.6	6.2	4.6	4.6	55	630	42	127	5.9	1.5	1.3
23	4.6	6.5	6.2	4.6	4.7	59	436	43	106	5.1	1.4	1.3
24	5.0	6.4	6.2	4.5	4.8	62	339	46	87	4.9	1.4	1.3
25	5.2	6.4	6.2	4.5	4.9	67	363	45	76	4.6	1.3	1.5
26	5.0	8.0	6.2	4.5	5.0	70	387	47	68	4.5	1.2	1.6
27	5.2	11	6.2	4.5	5.1	68	294	50	61	4.9	1.1	1.6
28	5.7	9.0	6.2	4.5	5.3	65	237	65	55	4.2	1.1	1.6
29	5.2	7.8	6.2	4.5	------	63	200	95	48	5.4	2.8	1.5
30	5.4	6.4	6.2	4.5	------	61	172	112	42	5.4	1.5	1.5
31	7.3	------	6.2	4.5	------	60	------	141	------	5.1	1.6	------
TOTAL	179.3	273.9	199.1	164.7	127.0	2,736.5	6,280	2,332	3,398	385.0	83.1	44.6
MEAN	5.78	9.13	6.42	5.31	4.54	88.3	209	75.2	113	12.4	2.68	1.49
MAX	13	13	8.5	6.4	5.3	250	658	150	355	37	4.5	2.1
MIN	2.4	6.4	5.8	4.5	4.3	5.5	54	42	40	4.2	1.1	1.1
CFSM	.01	.02	.02	.01	.01	.22	.53	.19	.28	.03	.007	.004
IN.	.02	.03	.02	.02	.01	.26	.59	.22	.32	.04	.008	.004
AC-FT	356	543	395	327	252	5,430	12,460	4,630	6,740	764	165	88

CAL YR 1969 TOTAL 46,330.0 MEAN 127 MAX 6,640 MIN 1.9 CFSM .32 IN 4.33 AC-FT 91,900
WTR YR 1970: TOTAL 16,203.2 MEAN 44.4 MAX 658 MIN 1.1 CFSM .11 IN 1.51 AC-FT 32,140

PEAK DISCHARGE (BASE, 300 CFS).--Apr. 21 (1830) 828 cfs (6.14 ft); June 18 (1015) 382 cfs (4.37 ft).

05294000 Pomme de Terre River at Appleton, Minn.

LOCATION.--Lat 45°12'10", long 96°01'20", in SW¼NW¼ sec.14, T.120 N., R.43 W., Swift County, on left bank 60 ft upstream from bridge on U.S. Highway 59 and State Highway 119 at Appleton and 8 miles upstream from mouth.

DRAINAGE AREA.--905 sq mi, approximately.

PERIOD OF RECORD.--March 1931 to September 1935 (no winter records), October 1935 to current year. Prior to October 1953, published as "near Appleton."

GAGE.--Water-stage recorder and concrete control. Datum of gage is 975.00 ft above mean sea level, datum of 1929. Prior to Dec. 22, 1952, nonrecording gage at site 4 miles upstream at datum 25.17 ft higher.

AVERAGE DISCHARGE.--35 years (1935-70), 101 cfs (1.52 inches per year, 73,170 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 605 cfs about Apr. 9 (gage height, 6.40 ft, high-water mark in well); minimum discharge, 13 cfs Sept. 7 (gage height, 4.27 ft).
Period of record: Maximum discharge, 5,520 cfs Apr. 11, 1969 (gage height, 13.78 ft); maximum gage height, 14.58 ft Apr. 9, 1969 (backwater from ice); no flow for several periods.

REMARKS.--Records good except those for winter periods, which are fair. Flow affected by lakes above station. Occasional regulation at low flow by old milldam 500 ft upstream.

REVISIONS (WATER YEARS).--WSP 1308: 1931(M), 1937(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	34	42	42	32	26	17	101	424	169	77	37	26
2	32	47	45	32	25	18	97	368	158	83	37	20
3	31	49	44	32	25	22	93	334	143	62	36	20
4	33	49	41	31	24	35	93	307	132	65	36	21
5	44	48	40	31	23	50	103	287	126	65	33	20
6	51	47	42	31	23	70	160	269	121	61	32	20
7	58	46	41	31	23	80	250	248	117	55	33	18
8	55	46	39	31	22	72	400	230	107	52	35	18
9	52	44	35	30	22	60	565	215	101	51	33	18
10	47	45	35	30	22	54	455	204	95	49	31	20
11	43	44	35	30	22	45	330	192	95	46	30	18
12	43	44	35	29	21	40	280	182	95	45	28	17
13	43	42	35	28	21	37	266	174	95	57	27	17
14	43	24	35	28	20	35	264	167	97	61	24	19
15	43	38	34	28	19	34	268	166	119	53	23	24
16	41	48	34	28	18	34	268	165	219	48	23	24
17	39	47	34	27	18	34	260	158	313	45	22	23
18	38	25	34	27	18	37	241	146	247	42	22	22
19	38	36	33	27	17	40	263	137	174	41	22	21
20	37	39	33	27	17	43	365	130	157	39	22	20
21	36	39	33	27	17	51	463	125	146	39	21	19
22	36	40	32	26	17	55	425	127	138	36	20	18
23	36	40	32	26	17	69	399	130	126	33	19	18
24	37	42	32	26	17	115	437	131	117	32	19	18
25	38	43	32	26	17	126	502	136	110	30	18	19
26	36	44	32	26	17	131	472	129	103	28	17	18
27	35	42	32	26	17	133	420	129	99	34	17	19
28	36	41	32	26	17	133	410	129	91	70	17	18
29	39	40	32	26	------	119	478	132	85	55	31	18
30	40	41	32	26	------	110	505	142	77	44	22	18
31	41	------	32	26	------	103	------	155	------	40	20	------
TOTAL	1,255	1,262	1,099	877	562	2,002	9,633	5,968	3,972	1,538	807	589
MEAN	40.5	42.1	35.5	28.3	20.1	64.6	321	193	132	49.6	26.0	19.6
MAX	58	49	45	32	26	133	565	424	313	83	37	26
MIN	31	24	32	26	17	17	93	125	77	28	17	17
CFSM	.04	.05	.04	.03	.02	.07	.35	.21	.15	.05	.03	.02
IN.	.05	.05	.05	.04	.02	.08	.40	.25	.16	.06	.03	.02
AC-FT	2,490	2,500	2,180	1,740	1,110	3,970	19,110	11,840	7,880	3,050	1,600	1,170

CAL YR 1969 TOTAL 90,222.5 MEAN 247 MAX 5,210 MIN 1.2 CFSM .27 IN 3.71 AC-FT 179,000
WTR YR 1970: TOTAL 29,564 MEAN 81.0 MAX 565 MIN 17 CFSM .09 IN 1.21 AC-FT 58,640

PEAK DISCHARGE (BASE, 200 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
About 4-9	Unknown	6.40	605	6-17	1100	5.81	332
4-30	0330	6.26	528				

05300000 Lac qui Parle River near Lac qui Parle, Minn.

LOCATION.--Lat 44°59'42", long 95°55'09", in SW¼SW¼ sec.27, T.118 N., R.42 W., Lac qui Parle County, on right bank 40 ft downstream from highway bridge and 0.5 mile southwest of village of Lac qui Parle.

DRAINAGE AREA.--983 sq mi.

PERIOD OF RECORD.--April 1910 to November 1914; March 1931 to current year (winter records incomplete prior to 1934). Published as "at Lac qui Parle," 1910-14.

GAGE.--Water-stage recorder. Datum of gage is 951.98 ft above mean sea level (Minnesota Highway Department bench mark). Apr. 27, 1910, to Nov. 15, 1914, nonrecording gage at site 2 miles downstream at different datum. Mar. 17, 1931, to Mar. 9, 1937, nonrecording gage at site 40 ft upstream at present datum.

AVERAGE DISCHARGE.--39 years (1912-13, 1931-32, 1933-70), 120 cfs (1.65 inches per year, 86,940 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 2,420 cfs June 20 (gage height, 7.49 ft; minimum daily discharge 1.6 cfs Jan. 20 to Feb. 22; minimum gage height, 0.65 ft on Oct. 4.
Period of record: Maximum discharge, 17,100 cfs Apr. 10, 1969 (gage height, 18.94 ft); maximum gage height, 19.37 ft Apr. 9, 1965, from floodmark, backwater from ice; no flow at times in several years.

REMARKS.--Records good except those for winter periods, which are fair.

REVISIONS (WATER YEARS).--WSP 1308: 1912(M), 1935(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.6	16	16	11	1.6	1.7	130	466	800	294	50	51
2	5.0	20	16	11	1.6	5.0	125	413	900	267	55	40
3	4.5	20	16	10	1.6	20	120	366	800	246	52	38
4	4.1	20	15	9.8	1.6	35	125	336	600	219	47	42
5	6.4	24	15	9.2	1.6	50	130	303	450	199	42	51
6	6.7	26	15	8.5	1.6	150	160	271	361	181	39	43
7	11	26	15	7.8	1.6	400	190	244	300	164	42	38
8	7.8	25	17	7.2	1.6	300	291	222	261	149	67	29
9	9.2	26	16	6.5	1.6	250	304	201	229	137	69	23
10	23	25	16	5.7	1.6	190	278	185	199	126	91	21
11	16	24	16	5.1	1.6	140	239	172	190	117	90	20
12	11	24	15	4.6	1.6	110	217	161	177	108	77	16
13	12	24	15	4.2	1.6	95	204	150	194	101	64	17
14	12	23	15	3.8	1.6	80	199	142	241	96	57	15
15	12	20	14	3.4	1.6	75	217	137	308	93	73	17
16	9.0	18	14	3.0	1.6	70	239	131	945	94	81	19
17	9.0	17	14	2.5	1.6	69	253	126	1,310	98	75	19
18	9.8	17	14	2.1	1.6	68	347	121	1,970	98	77	25
19	13	16	13	1.8	1.6	70	421	114	2,350	92	65	25
20	15	16	13	1.6	1.6	75	460	109	2,360	86	53	22
21	14	16	12	1.6	1.6	80	658	101	2,010	80	45	23
22	12	16	13	1.6	1.6	85	991	95	1,490	73	38	21
23	12	16	14	1.6	1.7	90	991	96	1,080	68	34	18
24	9.7	16	14	1.6	1.7	100	873	99	833	63	30	18
25	9.7	16	13	1.6	1.8	120	804	101	695	58	27	16
26	9.5	16	13	1.6	1.8	140	858	120	598	54	24	14
27	8.8	16	13	1.6	1.8	170	839	150	534	51	21	11
28	8.4	16	13	1.6	1.7	160	719	250	462	46	20	9.5
29	8.0	16	12	1.6	------	150	617	350	394	45	29	11
30	8.7	16	12	1.6	------	145	546	500	338	44	32	9.5
31	11	------	12	1.6	------	140	------	650	------	52	25	------
TOTAL	313.9	587	441	136.4	45.7	3,633.7	12,545	6,882	23,379	3,599	1,591	722.0
MEAN	10.1	19.6	14.2	4.40	1.63	117	418	222	779	116	51.3	24.1
MAX	23	26	17	11	1.8	400	991	650	2,360	294	91	51
MIN	4.1	16	12	1.6	1.6	1.7	120	95	177	44	20	9.5
CFSM	.01	.02	.01	.004	.002	.12	.43	.23	.79	.12	.05	.02
IN.	.01	.02	.02	.005	.002	.14	.47	.26	.88	.14	.06	.03
AC-FT	623	1,160	875	271	91	7,210	24,880	13,650	46,370	7,140	3,160	1,430

CAL YR 1969 TOTAL 128,830.20 MEAN 353 MAX 16,000 MIN 0 CFSM .36 IN 4.87 AC-FT 255,500
WTR YR 1970: TOTAL 53,875.7 MEAN 148 MAX 2,360 MIN 1.6 CFSM .15 IN 2.04 AC-FT 106,900

05301000 Minnesota River near Lac qui Parle, Minn.

LOCATION.--Lat 45°01'17", long 95°52'05", in NW¼NE¼ sec.24, T.118 N., R.42 W., Chippewa County, on left bank 200 ft downstream from dam at Lac qui Parle Outlet, 2.4 miles northeast of village of Lac qui Parle, and 3.5 miles west of Watson.

DRAINAGE AREA.--4,050 sq mi, approximately.

PERIOD OF RECORD.--October 1942 to current year.

GAGE.--Water-stage recorder. Datum of gage is 900.00 ft above mean sea level, datum of 1929 (levels by Corps of Engineers). Prior to Nov. 10, 1944, at datum 0.20 ft lower.

AVERAGE DISCHARGE.--28 years, 636 cfs (460,800 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 2.060 cfs May 1 (gage height, 28.67 ft); minimum daily, 5.4 cfs Sept. 17; minimum gage height, 20.18 ft Sept. 16, 17, 18.
Period of record: Maximum discharge, 29,400 cfs Apr. 12, 1969 (gage height, 39.75 ft); no flow Nov. 17, 1942, Sept. 29, 1947, Oct. 19 to Nov. 18, 1951, Nov. 24, 1952.

REMARKS.--Records good except those for winter periods, which are fair. Part of flow from 2,050 square miles of Chippewa River basin at times diverted into Minnesota River above station. ~~Some regulation by~~ Big Stone Lake ~~since Apr. 17, 1970~~, Lac qui Parle Lake since January 1938, and Marsh Lake ~~since Nov. 1, 1939~~. ~~Flow affected by reduced~~ storage in ~~Sec 8 reservoir~~ by

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	24	22	147	202	175	163	571	2,080	411	1,460	66	26
2	24	22	147	202	178	117	531	1,880	593	1,310	68	15
3	23	22	144	199	180	89	495	1,730	756	1,120	52	13
4	23	11	147	199	184	86	497	1,610	968	1,010	25	14
5	24	11	147	207	187	89	495	1,500	1,060	641	25	14
6	24	11	147	209	178	89	497	1,230	1,060	504	27	14
7	23	11	144	207	175	89	504	1,040	1,060	384	22	14
8	24	11	147	209	173	91	504	1,050	1,040	353	21	12
9	25	12	147	211	173	86	555	1,050	1,020	379	19	7.5
10	25	12	147	211	171	86	603	1,040	1,010	240	19	15
11	25	13	147	199	173	91	651	941	1,000	147	19	19
12	24	15	147	199	173	91	788	865	979	147	19	19
13	24	26	144	199	173	109	965	863	845	105	19	19
14	24	79	147	199	173	139	1,040	735	696	21	19	19
15	19	161	147	195	173	142	1,030	598	696	20	19	19
16	19	161	147	192	173	199	1,120	598	715	21	19	11
17	19	161	147	192	147	247	1,220	598	981	42	20	5.4
18	20	157	144	191	151	247	1,190	598	1,350	63	20	22
19	20	153	144	191	158	247	1,180	598	1,600	63	20	40
20	20	151	147	190	160	274	1,400	521	1,640	64	20	40
21	21	151	144	190	160	358	1,760	449	1,600	64	33	41
22	23	149	119	189	161	355	1,950	451	1,610	64	35	41
23	23	149	89	187	162	435	1,960	459	1,610	66	35	41
24	22	147	159	186	163	499	1,960	461	1,610	66	35	41
25	22	147	223	184	163	591	1,960	471	1,600	66	35	41
26	22	147	209	183	163	679	1,960	471	1,590	66	35	41
27	23	147	207	185	163	677	1,960	475	1,570	66	44	41
28	22	147	204	180	163	679	1,950	394	1,540	66	28	42
29	22	147	202	187	------	682	2,010	269	1,520	66	28	42
30	22	147	204	183	------	675	2,070	276	1,490	66	28	42
31	22	------	204	183	------	622	------	281	------	66	28	------
TOTAL	697	2,700	4,889	6,040	4,726	9,023	35,376	25,582	35,220	8,816	902	770.9
MEAN	22.5	90.0	158	195	169	291	1,179	825	1,174	284	29.1	25.7
MAX	25	161	223	211	187	682	2,070	2,080	1,640	1,460	68	42
MIN	19	11	89	180	147	86	495	269	411	20	19	5.4
AC-FT	1,380	5,360	9,700	11,980	9,370	17,900	70,170	50,740	69,860	17,490	1,790	1,530

CAL YR 1969 TOTAL 532,256 MEAN 1,458 MAX 28,700 MIN 11 AC-FT 1,056,000
WTR YR 1970 TOTAL 134,741.9 MEAN 369 MAX 2,080 MIN 5.4 AC-FT 267,300

05304500 Chippewa River near Milan, Minn.

LOCATION.--Lat 45°06'39", long 95°47'57", in SE¼SE¼ sec.16, T. 119 N., R. 41 W., Chippewa County, on right bank 800 ft upstream from bridge on State Highway 40, 2.0 miles upstream from small tributary, and 5.5 miles east of Milan.

DRAINAGE AREA.--1,870 sq mi, approximately.

PERIOD OF RECORD.-- March 1937 to current year.

GAGE.--Water-stage recorder. Datum of gage is 959.69 ft above mean sea level, datum of 1929. Prior to ~~June 15, 1942~~, nonrecording gage on bridge 800 ft downstream at same datum.

AVERAGE DISCHARGE.--33 years, 249 cfs (1.80 inches per year, 180,400 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 1,370 cfs Apr. 9 (gage height, 4.64 ft); minimum, 26 cfs Sept. 12 (gage height, 1.30 ft).
Period of Record: Maximum discharge, 11,400 cfs Apr. 9, 1969 (gage height, 15.45 ft); no flow at times during 1940.

REMARKS.--Records good except those for winter periods, which are fair. Flow regulated by several small lakes above gage.

REVISIONS (WATER YEARS).--WSP 1145: Drainage area.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	69	85	79	59	38	38	95	979	451	188	100	52
2	69	91	78	58	38	38	110	918	441	183	94	46
3	71	96	78	57	38	60	150	896	423	176	87	45
4	69	100	75	56	38	80	190	852	411	171	80	45
5	78	101	72	56	38	70	250	809	398	168	73	41
6	87	100	72	55	38	60	400	760	385	161	68	37
7	100	99	72	54	38	58	600	722	366	154	69	34
8	102	101	71	53	38	56	800	685	347	145	87	31
9	100	100	71	52	38	55	1,130	652	326	136	81	32
10	91	100	70	50	38	55	771	620	305	130	80	32
11	89	104	70	45	38	55	733	594	296	125	75	31
12	85	98	69	43	38	55	722	567	299	119	68	27
13	85	90	68	42	38	54	722	546	293	150	66	29
14	83	84	68	41	38	54	701	525	293	134	64	29
15	87	79	68	41	38	54	701	515	305	132	64	35
16	85	89	67	41	38	54	706	499	460	125	56	38
17	83	88	66	40	38	54	663	484	599	119	58	39
18	81	77	66	40	38	55	625	465	479	110	53	41
19	80	76	65	39	38	55	679	446	398	127	52	41
20	78	76	65	39	38	56	869	423	385	134	47	38
21	76	77	64	38	38	56	863	411	370	152	45	38
22	85	78	64	38	38	56	798	398	354	141	41	35
23	78	79	63	38	38	57	803	402	326	130	41	35
24	73	80	63	38	38	58	957	411	305	121	35	34
25	74	80	62	38	38	60	957	402	283	110	33	35
26	73	80	62	37	38	62	885	389	268	102	33	34
27	68	80	61	37	38	64	836	389	252	94	31	34
28	71	80	61	37	38	66	962	381	237	91	31	37
29	68	79	60	37	------	68	1,060	398	222	125	42	34
30	68	79	60	37	------	72	1,020	423	202	125	56	33
31	79	------	59	37	------	80	------	446	------	113	46	------
TOTAL	2,485	2,626	2,089	1,373	1,064	1,815	20,758	17,407	10,479	4,191	1,856	1,092
MEAN	80.2	87.5	67.4	44.3	38.0	58.5	692	562	349	135	59.9	36.4
MAX	102	104	79	59	38	80	1,130	979	599	188	100	52
MIN	68	76	59	37	38	38	95	381	202	91	31	27
CFSM	.04	.05	.04	.02	.02	.03	.37	.30	.19	.07	.03	.02
IN.	.05	.05	.04	.03	.02	.04	.41	.35	.21	.08	.04	.02
AC-FT	4,930	5,210	4,140	2,720	2,110	3,600	41,170	34,530	20,790	8,310	3,680	2,170

CAL YR 1969 TOTAL 186,859 MEAN 512 MAX 10,100 MIN 21 CFSM .27 IN 3.72 AC-FT 370,600
WTR YR 1970: TOTAL 67,235 MEAN 184 MAX 1,130 MIN 27 CFSM .10 IN 1.34 AC-FT 133,400

PEAK DISCHARGE (BASE, 400 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
4-9	1415	4.64	1,370	6-17	0800	3.21	620
4-28	2200	4.19	1,090				

05311000 Minnesota River at Montevideo, Minn.

LOCATION.--Lat 44°56'00", long 95°44'00", in NW¼NW¼ sec.19, T.117 N., R.40 W., Lac qui Parle County, on right bank 100 ft upstream from bridge on U.S. Highway 212, at Montevideo, and 400 ft downstream from Chippewa River.

DRAINAGE AREA.--6,180 sq mi, approximately.

PERIOD OF RECORD.--July 1909 to September 1917, October 1917 to September 1929 (no winter records), October 1929 to current year. Prior to October 1939, published as "near Montevideo." Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 909.12 ft above mean sea level, datum of 1929. July 22, 1909, to Feb. 4, 1932, nonrecording gage at bridge 600 ft downstream at present datum. Feb. 5, 1932, to Nov. 26, 1934, nonrecording gage at bridge 100 ft downstream at present datum.

AVERAGE DISCHARGE.--49 years (1909-17, 1929-70), 657 cfs (1.44 inches per year, 476,000 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 2,810 cfs May 1 (gage height, 10.38 ft); minimum daily, 24 cfs Sept. 17.
Period of record: Maximum discharge, 35,100 cfs Apr. 12, 1969 (gage height, 21.68 ft, from high-water mark); no flow for several days in 1933-34, 1936.

REMARKS.--Records good except those for winter months, which are fair. Flow ~~regulated by~~ affected by natural storage in Big Stone Lake, ~~since Apr. 17, 1937,~~ Lac qui Parle Lake since January 1938 and Marsh Lake since Nov. 1, 1939. Some regulation by

REVISIONS (WATER YEARS).--WSP 1035: 1919(M). WSP 1085: 1935-36. WSP 1508: 1912, 1925(M), 1929(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	43	57	160	261	213	201	639	2,800	624	1,650	131	52
2	43	59	160	260	216	155	615	2,730	763	1,620	132	33
3	44	60	160	256	218	170	563	2,490	906	1,360	132	28
4	42	49	160	265	222	160	558	2,360	1,060	1,240	103	34
5	52	50	160	263	225	159	573	2,140	1,230	996	71	36
6	61	49	160	264	216	149	594	1,980	1,270	742	79	38
7	73	48	160	268	213	147	673	1,680	1,260	613	93	38
8	76	50	155	262	211	147	843	1,570	1,240	551	102	37
9	75	50	155	263	211	141	1,180	1,550	1,190	529	99	37
10	66	50	159	261	211	141	1,320	1,520	1,160	504	98	36
11	64	59	167	244	211	146	1,230	1,480	1,160	350	97	36
12	59	63	142	243	211	146	1,270	1,340	1,130	306	97	36
13	59	50	142	238	211	163	1,430	1,300	1,090	307	95	35
14	57	56	155	240	211	193	1,540	1,260	897	254	81	34
15	56	60	165	236	211	196	1,570	1,060	898	126	95	32
16	54	68	214	233	211	253	1,570	1,010	1,070	96	77	27
17	52	78	213	232	185	301	1,680	994	1,210	143	76	24
18	50	90	210	231	199	302	1,670	966	1,490	174	76	28
19	50	100	209	230	196	298	1,700	944	1,680	195	74	34
20	48	115	212	229	198	326	1,800	900	1,860	202	71	46
21	47	123	208	228	198	408	2,230	782	1,930	204	69	63
22	58	134	188	227	199	403	2,530	747	1,920	208	73	65
23	50	141	152	225	200	452	2,610	732	1,910	206	76	60
24	46	147	222	224	201	507	2,630	736	1,890	203	77	54
25	46	150	285	222	201	581	2,700	732	1,860	206	73	53
26	43	151	271	220	201	690	2,690	724	1,830	198	70	52
27	38	152	268	222	201	742	2,640	741	1,800	183	67	52
28	34	157	265	217	201	739	2,590	728	1,770	147	66	51
29	36	158	262	224	------	733	2,630	612	1,730	138	67	51
30	39	160	264	220	------	723	2,770	584	1,690	137	63	50
31	51	------	263	220	------	708	------	607	------	134	58	------
TOTAL	1,612	2,734	6,066	7,428	5,802	10,580	49,038	39,799	41,518	13,922	2,638	1,252
MEAN	52.0	91.1	196	240	207	341	1,635	1,284	1,384	449	85.1	41.7
MAX	76	160	285	268	225	742	2,770	2,800	1,930	1,650	132	65
MIN	34	48	142	217	185	141	558	584	624	96	58	24
AC-FT	3,200	5,420	12,030	14,730	11,510	20,990	97,270	78,940	82,350	27,610	5,230	2,480

CAL YR 1969 TOTAL 660,137 MEAN 1,809 MAX 34,400 MIN 31 AC-FT 1,309,000
WTR YR 1970 TOTAL 182,389 MEAN 500 MAX 2,800 MIN 24 AC-FT 361,800

05311400 South Branch Yellow Medicine River at Minneota, Minn.

LOCATION.--Lat 44°33'50", long 95°59'50", in SE¼ sec.26, T.113 N., R.43 W., Lyon County, on downstream side of bridge on State Highway 68, 0.5 mile northwest of Minneota, and 6 miles upstream from confluence with North Branch Yellow Medicine River.

DRAINAGE AREA.--111 sq mi, approximately.

PERIOD OF RECORD.--April 1960 to current year. Monthly and daily discharge for the period Apr. 1, 1960 to June 30, 1960, published in WSP 1914.

GAGE.--Nonrecording gage read once daily. Datum of gage is 1,150.00 ft above mean sea level, datum of 1929. ~~Prior to Mar. 21, 1963, nonrecording gage at same site and datum.~~

AVERAGE DISCHARGE.--10 years, 24.1 cfs (2.95 inches per year, 17,460 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 208 cfs Apr. 24 (gage height, 6.57 ft); minimum, 0.07 cfs Aug. 24, 26, 27, 28; minimum gage height, 3.34 ft Aug. 24, 26, 27, 28.
Period of record: Maximum discharge, 4,430 cfs Apr. 8, 1969 (gage height, 13.41 ft); no flow at times.

REMARKS.--Records good except those for winter periods, which are fair.
Add stmement under 05 416500

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	1.2	5.4	2.7	1.1	1.3	1.2	16	46	18	6.4	.59	.15
2	1.1	5.9	2.9	1.1	1.2	1.2	17	40	17	6.4	.40	.15
3	.99	6.4	2.9	1.1	1.2	1.3	21	36	15	5.0	.29	1.4
4	1.3	6.9	2.9	1.1	1.2	1.5	22	33	13	4.2	.34	1.3
5	1.6	6.6	2.9	1.1	1.2	1.8	34	30	11	3.5	.46	1.0
6	2.0	6.2	2.9	1.1	1.2	2.1	63	27	10	2.9	.52	.82
7	2.4	5.7	2.9	1.1	1.2	2.2	64	25	8.6	3.3	.74	.52
8	2.2	5.4	2.9	1.1	1.2	2.2	60	23	6.6	2.4	9.9	.34
9	1.8	4.7	2.9	1.1	1.2	2.2	40	22	5.8	1.9	6.4	.15
10	1.4	4.1	2.9	1.1	1.2	2.2	44	20	5.0	1.9	2.3	.11
11	1.3	4.1	2.9	1.1	1.2	2.2	38	18	5.3	1.5	1.6	.15
12	1.8	4.1	2.9	1.1	1.2	2.2	37	18	5.3	1.0	1.3	.15
13	3.6	4.0	2.9	1.1	1.2	2.2	52	18	6.9	6.4	1.0	.11
14	4.5	4.1	2.9	1.1	1.2	2.2	49	18	6.1	8.6	.66	.15
15	3.6	4.1	2.9	1.1	1.2	2.2	53	18	24	8.0	.82	.24
16	3.6	4.0	2.9	1.1	1.2	2.2	81	16	147	3.3	.46	.82
17	3.4	3.6	2.9	1.1	1.2	2.2	51	15	129	1.8	.46	1.0
18	3.2	3.1	2.8	1.1	1.2	2.3	26	14	90	1.5	.40	.74
19	3.0	2.5	2.7	1.1	1.2	2.4	70	13	58	1.4	.40	.52
20	2.8	2.5	2.6	1.1	1.2	30	151	11	60	1.2	.24	.40
21	3.4	2.5	2.2	1.1	1.2	33	126	11	42	1.0	.15	.34
22	2.2	2.6	2.0	1.1	1.2	32	78	11	33	.91	.15	.34
23	1.8	2.7	1.8	1.1	1.2	32	99	11	26	.66	.11	.29
24	2.0	2.7	1.6	1.1	1.2	32	208	13	22	.59	.07	.29
25	2.4	2.7	1.5	1.1	1.2	32	170	12	18	.52	.11	.34
26	2.0	2.7	1.4	1.2	1.2	33	109	10	16	.40	.07	.34
27	2.6	2.6	1.3	1.2	1.2	33	76	12	13	.34	.07	.46
28	2.4	2.5	1.2	1.2	1.2	30	64	14	11	.40	.07	.46
29	2.4	2.6	1.2	1.2	------	19	56	15	9.7	.46	.15	.34
30	2.6	2.6	1.1	1.2	------	13	50	18	9.4	.59	.15	.19
31	4.5	------	1.1	1.4	------	15	------	19	------	.66	.19	------
TOTAL	75.09	119.6	73.6	34.9	33.7	372.0	2,025	607	841.7	79.13	30.57	13.61
MEAN	2.42	3.99	2.37	1.13	1.20	12.0	67.5	19.6	28.1	2.55	.99	.45
MAX	4.5	6.9	2.9	1.4	1.3	33	208	46	147	8.6	9.9	1.4
MIN	.99	2.5	1.1	1.1	1.2	1.2	16	10	5.0	.34	.07	.11
CFSM	.022	.036	.021	.010	.011	.11	.61	.18	.25	.023	.009	.004
IN.	.03	.04	.02	.01	.01	.12	.68	.20	.28	.03	.01	.004
AC-FT	149	237	146	69	67	738	4,020	1,200	1,670	157	61	27

CAL YR 1969	TOTAL 24,043.09	MEAN 65.9	MAX 3,500	MIN .99	CFSM .59	IN 8.06	AC-FT 47,690
WTR YR 1970	TOTAL 4,305.90	MEAN 11.8	MAX 208	MIN .07	CFSM .11	IN 1.44	AC-FT 8,540

05313500 Yellow Medicine River near Granite Falls, Minn.

LOCATION.--Lat 44°43'18" long 95°31'07", in SW¼ sec.35, T.115 N., R.39 W., Yellow Mecicine County, on right bank 50 ft downstream from highway bridge, 6 miles upstream from mouth, and 8 miles south of town of Granite Falls.

DRAINAGE AREA.--653 sq mi.

PERIOD OF RECORD.--March 1931 to September 1935 (no winter records), October 1935 to September 1938, October 1939 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 971.59 ft above mean sea level, datum of 1929. Mar. 16, 1931, to June 13, 1938, nonrecording gage, on bridge 50 ft upstream at same datum. Oct. 12, 1939, to Nov. 30, 1952, nonrecording gage 500 ft downstream at same datum.

AVERAGE DISCHARGE.--34 years (1935-38, 1939-70), 106 cfs (2.07 inches per year, 76,800 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 922 cfs June 18 (gage height, 4.64 ft); minimum, 4.0 cfs Oct. 4 (gage height, 2.28 ft).
Period of record: Maximum discharge, 17,200 cfs Apr. 10, 1969 (gage height, 14.90 ft); no flow at times in 1931, 1933, 1948, 1959.
Flood in June 1919 reached a stage of 17.5 ft, from information by local residents.

REMARKS.--Records good except those for winter periods, which are fair. Add [illegible] under 05316500

REVISIONS (WATER YEARS).--WSP 1508: 1931, 1934(M), 1937(M), 1946(M), 1950(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.8	26	17	13	8.8	6.2	68	414	198	148	39	33
2	5.4	26	17	12	8.6	6.3	80	360	195	133	33	27
3	4.6	29	17	12	8.0	6.5	90	318	185	120	28	38
4	4.6	27	16	12	7.5	7.0	100	285	168	109	26	41
5	7.7	34	16	12	7.2	8.0	115	255	152	98	22	33
6	7.7	22	15	12	7.0	10	150	230	136	87	20	32
7	5.8	20	15	12	6.8	15	258	209	120	78	22	29
8	5.8	21	15	12	6.6	30	387	188	103	69	57	25
9	5.0	21	15	11	6.5	50	297	171	90	62	92	20
10	6.2	21	14	11	6.4	48	219	155	87	55	90	19
11	6.2	21	14	11	6.3	46	185	139	103	49	78	17
12	6.7	20	14	11	6.2	44	165	126	87	48	69	14
13	9.0	19	14	11	6.2	42	158	117	78	69	67	12
14	8.3	15	14	11	6.1	40	168	117	80	72	62	12
15	7.7	17	14	11	6.1	39	216	111	120	136	67	15
16	8.3	19	14	10	6.1	38	230	103	378	126	65	16
17	9.7	19	14	10	6.1	37	314	98	610	111	62	17
18	12	18	14	10	6.1	36	369	92	850	98	57	16
19	15	14	14	10	6.1	36	330	87	876	87	51	14
20	15	15	14	9.8	6.1	36	348	83	730	78	45	13
21	17	15	14	9.7	6.1	37	565	78	610	57	39	14
22	17	15	14	9.6	6.1	38	742	78	520	60	35	13
23	15	15	14	9.4	6.1	40	676	78	452	52	30	11
24	16	16	13	9.3	6.1	42	634	76	392	45	27	11
25	16	16	13	9.2	6.1	45	712	76	335	38	25	13
26	16	16	13	9.0	6.1	50	832	74	289	34	21	13
27	17	16	13	9.0	6.1	60	784	90	255	32	17	12
28	18	16	13	9.0	6.1	80	652	111	226	28	18	11
29	18	17	13	9.0	------	78	555	130	198	28	20	10
30	18	17	13	8.8	------	75	471	162	171	45	18	9.0
31	22	------	13	8.8	------	72	------	178	------	51	16	------
TOTAL	346.5	583	443	324.6	183.6	1,198.0	10,870	4,789	8,794	2,303	1,318	560.0
MEAN	11.2	19.4	14.3	10.5	6.56	38.6	362	154	293	74.3	42.5	18.7
MAX	22	34	17	13	8.8	80	832	414	876	148	92	41
MIN	4.6	14	13	8.8	6.1	6.2	68	74	78	28	16	9.0
CFSM	.02	.03	.02	.02	.01	.06	.55	.24	.45	.11	.07	.03
IN.	.02	.03	.03	.02	.01	.07	.62	.27	.50	.13	.08	.03
AC-FT	687	1,160	879	644	364	2,380	21,560	9,500	17,440	4,570	2,610	1,110

CAL YR 1969 TOTAL 126,588.5 MEAN 347 MAX 16,400 MIN 4.6 CFSM .53 IN 7.21 AC-FT 251,100
WTR YR 1970: TOTAL 31,712.7 MEAN 86.9 MAX 876 MIN 4.6 CFSM .13 IN 1.61 AC-FT 62,900

PEAK DISCHARGE (BASE, 300 CFS)

DATE	TIME	G. H.	DISCHARGE	DATE	TIME	G. H.	DISCHARGE
4-8	1645	3.77	419	6-18	2200	4.64	922
4-26	1345	4.56	850				

05315000 Redwood River at Marshall, Minn.

LOCATION.--Lat 44°27'05", long 95°47'13", in SE¼NW¼ sec.4, T.111 N., R.41 W., Lyon County, on downstream side of highway bridge on Fourth Street in Marshall and 10 miles upstream from Threemile Creek.

DRAINAGE AREA.--307 sq mi.

PERIOD OF RECORD.--March 1940 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Nonrecording gage and crest-stage gage. Datum of gage is 1,144.88 ft above mean sea level, datum of 1929. Nonrecording gage and crest-stage gage on diversion channel. Datum of gage is 1,100.00 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

AVERAGE DISCHARGE.--30 years, 48.6 cfs (2.14 inches per year, 35,210 acre-ft per year).

EXTREMES (Combined flow).--Current year: Maximum discharge, 485 cfs Apr. 5; minimum, 2.0 cfs Sept. 8.
Period of record: Maximum discharge, 5,590 cfs Apr. 10, 1969; no flow at times
(River only).--Current year: Maximum discharge, 485 cfs Apr. 5 (gage height, 3.33 ft); minimum, 2.0 cfs Sept. 8 (gage height, 0.77 ft); minimum gage height, 0.75 ft Aug. 25, 26.
Period of record: Maximum discharge, 5,370 cfs June 17, 1957; maximum gage height, 11.05 ft Apr. 6, 1957 (from floodmark); no flow at times.
(Diversion only).--Current year: No flow.
Period of record: Maximum discharge, 4,440 cfs Apr. 10, 1969 (gage height, 78.45 ft); no flow on many days.

REMARKS.--Records good except those for winter periods, which are fair. Water diverted at medium and high stages into diversion channel 3 miles above station, bypasses station and returns to river 1 mile below station. Diversion began Mar. 18, 1964. These records include flow in diversion channel. ~~Unknown amount of natural diversion into Cottonwood River basin at extremely high stages.~~ Records of water temperatures and suspended sediment loads for the current year are published in Part 2 of this report.

Tandar 131650.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.2	8.5	6.0	5.7	3.4	7.3	150	128	86	24	4.1	2.6
2	6.7	8.5	6.1	5.6	3.5	7.4	231	118	79	22	3.2	2.6
3	6.7	9.8	6.9	5.4	3.5	7.5	248	106	73	20	3.6	3.6
4	7.9	7.9	7.1	5.3	3.5	7.6	242	89	57	16	3.6	2.9
5	8.5	8.5	7.4	5.2	3.6	7.9	350	79	45	14	3.2	2.6
6	7.3	8.5	6.8	5.0	3.6	8.0	278	71	35	14	4.1	2.6
7	7.3	11	5.2	4.9	3.7	8.3	206	63	28	14	56	2.2
8	7.9	15	5.0	4.8	3.7	8.7	213	56	28	12	30	2.0
9	7.3	10	5.5	4.7	3.8	9.0	173	48	25	12	11	2.2
10	10	7.9	5.4	4.5	4.0	9.4	127	45	24	10	9.1	2.2
11	10	7.9	5.5	4.4	4.1	9.6	99	43	26	9.1	7.3	2.6
12	7.3	9.8	5.7	4.3	4.3	9.9	89	43	34	7.9	7.3	2.4
13	6.7	9.8	5.1	4.1	4.5	10	94	40	34	23	5.6	2.6
14	9.1	9.6	4.9	4.0	5.0	11	86	39	34	13	5.1	3.2
15	9.8	9.6	4.9	3.9	5.5	11	96	38	31	10	5.1	4.1
16	10	9.6	7.3	3.8	5.9	12	110	35	51	8.5	5.1	4.1
17	9.1	9.6	7.0	3.7	6.2	13	120	31	63	6.7	4.6	3.2
18	6.8	9.5	6.9	3.6	6.3	14	123	29	74	6.7	5.1	3.6
19	4.6	9.5	6.8	3.5	6.4	15	141	25	88	6.7	4.6	3.4
20	4.6	9.5	6.8	3.5	6.4	16	206	23	91	6.7	4.1	3.2
21	6.7	9.5	6.7	3.4	6.4	17	224	22	77	5.6	4.1	3.2
22	8.5	9.5	6.6	3.3	6.5	18	231	18	68	5.1	4.1	2.9
23	7.9	9.4	6.5	3.3	6.6	20	231	20	60	4.6	3.2	2.6
24	6.2	9.0	6.4	3.3	6.8	22	278	18	58	4.6	2.9	3.2
25	8.5	8.4	6.3	3.3	6.9	24	283	18	50	4.6	2.6	4.1
26	6.7	7.6	6.2	3.3	7.0	27	272	18	47	3.6	2.4	3.2
27	6.7	7.0	6.1	3.3	7.1	31	238	23	42	2.9	2.4	3.2
28	7.9	6.9	6.1	3.3	7.2	37	202	28	36	3.6	2.6	3.2
29	9.8	7.0	6.0	3.3	------	47	177	36	31	2.9	2.9	2.9
30	8.5	7.2	5.9	3.4	------	62	150	48	26	6.7	2.2	3.6
31	7.9	------	5.8	3.4	------	83	------	63	------	5.1	2.6	------
TOTAL	239.1	271.5	190.9	126.5	145.4	590.6	5,668	1,461	1,501	305.6	213.8	90.0
MEAN	7.71	9.05	6.16	4.08	5.19	19.1	189	47.1	50.0	9.86	6.90	3.00
MAX	10	15	7.4	5.7	7.2	83	350	128	91	24	56	4.1
MIN	4.6	6.9	4.9	3.3	3.4	7.3	86	18	24	2.9	2.2	2.0
CFSM	.025	.030	.020	.013	.017	.062	.62	.15	.16	.032	.023	.010
IN.	.03	.03	.02	.02	.02	.07	.69	.18	.18	.04	.03	.01

CAL YR 1969 TOTAL 47,156.7 MEAN 129 MAX 4,760 MIN 4.1 CFSM .42 IN 5.71
WTR YR 1970 TOTAL 10,803.4 MEAN 29.6 MAX 350 MIN 2.0 CFSM .09 IN 1.31

05316500 Redwood River near Redwood Falls, Minn.

LOCATION.--Lat 44°31'25", long 95°10'20", in SE¼NE¼ sec. 9, T.112 N., R.36 W., Redwood County, on right bank 20 ft upstream from highway bridge, 3 miles west of town of Redwood Falls, and 8.5 miles upstream from mouth.

DRAINAGE AREA.--697 sq mi.

PERIOD OF RECORD.--July 1909 to September 19~~11~~ 14 (no winter records), except 1911-12 October ~~1911 to September 1912, October 1913 to September 1914~~ and August 1930 to ~~September 1935~~ current year (no winter records), ~~October 1935 to current year~~ 1930-35.

GAGE.--Water-stage recorder. Datum of gage is 972.33 ft above mean sea level, datum of 1929. July 1909 to September 1914, nonrecording gage at bridge 20 ft downstream at datum 0.22 ft lower. August 1930, to Oct. 25, 1949, nonrecording gage, at bridge 20 ft downstream at present datum.

AVERAGE DISCHARGE.--36 years (1911-12, 1935-70), 104 cfs (2.03 inches per year, 75,400 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 602 cfs Apr. 8 (gage height, 3.42 ft); minimum daily, 4.3 cfs Feb. 13-21; minimum gage height, 1.55 ft Aug. 27, Sept. 12.
Period of Record: Maximum discharge, 19,700 cfs June 18, 1957 (gage height, 15.92 ft, from floodmark); no flow for several days in January 1940 and for part of each day Aug. 19, 20, 1959.

REMARKS.--Records good except those for winter periods, which are fair. Natural discharge affected by unknown amount of interbasin flow between Yellow Medicine, Redwood, and Cottonwood River basins during extreme floods. Records of water temperatures and suspended sediment loads for the current year are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	17	23	21	10	5.1	4.6	63	313	237	72	29	21
2	19	31	22	9.6	5.1	4.6	63	281	206	65	24	18
3	16	31	22	9.4	5.0	4.6	66	253	182	55	21	20
4	17	30	21	9.3	4.8	4.6	80	233	157	49	19	28
5	18	30	20	9.2	4.6	4.6	120	205	134	46	18	30
6	19	28	19	9.1	4.5	5.0	209	182	111	42	18	23
7	16	27	18	9.0	4.5	17	337	164	98	39	19	19
8	16	25	18	8.9	4.4	50	541	147	87	36	47	17
9	17	23	17	8.7	4.4	70	390	138	78	33	161	14
10	17	23	17	8.6	4.4	65	325	126	74	31	138	14
11	16	25	16	8.5	4.4	62	265	117	75	29	114	13
12	16	27	16	8.4	4.4	58	217	112	76	29	98	12
13	17	31	16	8.3	4.3	55	197	105	82	42	82	12
14	18	21	15	8.1	4.3	52	205	100	84	106	68	12
15	21	21	15	8.0	4.3	50	213	99	97	138	57	14
16	23	23	15	7.6	4.3	48	233	96	283	120	47	14
17	22	28	14	7.4	4.3	47	245	92	515	102	39	19
18	21	25	14	7.2	4.3	47	241	87	363	87	33	20
19	21	19	14	6.9	4.3	47	253	79	297	72	31	19
20	20	18	14	6.6	4.3	48	329	74	277	59	28	18
21	19	18	14	6.3	4.3	48	413	70	249	49	26	17
22	19	18	13	6.1	4.4	51	450	70	205	41	23	15
23	19	19	13	5.9	4.5	54	500	67	171	35	21	14
24	17	20	12	5.7	4.7	56	557	69	154	29	19	14
25	18	20	12	5.6	5.0	60	563	71	132	27	18	14
26	18	19	11	5.5	4.8	63	568	66	118	24	16	14
27	18	19	11	5.4	4.7	66	546	85	106	22	14	15
28	17	19	11	5.4	4.6	67	475	84	96	21	14	14
29	18	19	11	5.3	------	66	408	94	87	22	14	13
30	18	20	10	5.2	------	64	350	115	79	26	16	12
31	21	------	10	5.2	------	63	------	190	------	31	17	------
TOTAL	569	700	472	230.4	127.0	1,402.0	9,422	3,984	4,910	1,579	1,289	499
MEAN	18.4	23.3	15.2	7.43	4.54	45.2	314	129	164	50.9	41.6	16.6
MAX	23	31	22	10	5.1	70	568	313	515	138	161	30
MIN	16	18	10	5.2	4.3	4.6	63	66	74	21	14	12
CFSM	.03	.03	.02	.01	.007	.06	.45	.18	.23	.07	.06	.02
IN.	.03	.04	.03	.01	.007	.07	.50	.21	.26	.08	.07	.03
AC-FT	1,130	1,390	936	457	252	2,780	18,690	7,900	9,740	3,130	2,560	990

CAL YR 1969 TOTAL 121,238.4 MEAN 332 MAX 13,200 MIN 3.8 CFSM .48 IN 6.47 AC-FT 240,500
WTR YR 1970: TOTAL 25,183.4 MEAN 69.0 MAX 568 MIN 4.3 CFSM .10 IN 1.34 AC-FT 49,950

PEAK DISCHARGE (BASE, 150 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
4-8	0530	3.44	614	7-14	2245	2.41	154
6-1	0315	2.65	209	8-9	1145	2.44	164
6-17	0445	3.34	557				

05316770 Minnesota River at New Ulm, Minn.

LOCATION.--Lat 44°19'29", long 94°27'09", in NE¼NE¼ sec. 20, T.110 N., R.30 W., Nicollet County, on left bank 30 ft downstream from U.S. Highway 14, at New Ulm and 6.1 miles upstream from Cottonwood River.

DRAINAGE AREA.--9,530 sq mi.

PERIOD OF RECORD.--October 1967 to current year.

GAGE.--Water-stage recorder. Datum of gage is 778.72 ft above mean sea level, datum of 1929.

EXTREMES.--Current year: Maximum discharge, 5,340 cfs June 22 (gage height, 15.56 ft); minimum daily discharge, 168 cfs Sept. 16.
Period of record: Maximum discharge, 58,000 cfs Apr. 15, 1969 (gage height, 30.65 ft); minimum daily discharge, 42 cfs Jan. 15, 19, 1968.

REMARKS.--Records good except those for winter periods, which are fair. Records of water temperatures and suspended sediment loads for the current year are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	223	230	250	320	340	365	880	4,460	2,530	2,720	387	179
2	212	228	249	335	340	375	930	4,250	2,720	2,570	367	197
3	207	236	249	340	335	385	1,000	4,070	2,720	2,380	355	226
4	206	247	248	345	335	395	1,080	3,880	2,580	2,260	344	298
5	202	253	248	350	335	405	1,180	3,970	2,520	2,120	322	337
6	203	260	248	350	330	410	1,280	3,720	2,500	1,990	306	357
7	206	268	248	355	330	415	1,560	3,690	2,520	1,740	295	332
8	210	272	247	355	330	420	2,230	3,450	2,500	1,620	291	286
9	208	268	247	360	325	430	2,510	3,230	2,510	1,350	278	249
10	222	268	247	360	325	435	2,560	2,990	2,510	1,250	262	223
11	226	268	246	360	325	450	2,550	2,820	2,360	1,070	266	202
12	220	256	246	360	320	460	2,470	2,720	2,370	962	339	184
13	216	240	246	360	320	470	2,410	2,640	2,530	1,070	375	173
14	208	232	246	360	320	480	2,250	2,570	2,620	1,170	368	168
15	212	230	245	360	320	495	2,240	2,490	2,660	1,250	333	172
16	222	234	245	360	320	510	2,360	2,370	2,700	1,300	304	170
17	218	238	244	360	320	525	2,470	2,290	3,160	1,200	290	172
18	220	223	244	360	320	540	2,530	2,210	3,870	1,030	284	172
19	222	222	244	360	320	555	2,600	2,110	4,470	854	282	177
20	224	230	243	360	325	565	2,710	2,080	4,910	742	257	184
21	222	235	243	360	325	590	2,960	2,030	5,160	672	236	188
22	236	240	242	355	330	610	3,120	2,010	5,320	626	220	186
23	218	245	241	355	335	625	3,470	1,980	5,280	602	210	181
24	218	250	230	355	335	640	3,580	1,920	5,090	581	201	176
25	216	250	230	355	340	660	3,900	1,910	4,780	555	193	172
26	208	250	235	350	345	680	3,970	1,860	4,320	521	186	174
27	206	250	250	350	350	700	4,140	1,880	3,830	489	181	180
28	208	250	260	345	355	730	4,250	2,190	3,450	465	177	180
29	210	250	280	345	------	770	4,300	2,460	3,160	450	174	182
30	212	250	295	345	------	800	4,360	2,460	2,920	443	173	184
31	228	------	310	340	------	840	------	2,530	------	412	172	------
TOTAL	6,669	7,373	7,746	10,925	9,250	16,730	77,850	85,240	100,570	36,464	8,428	6,261
MEAN	215	246	250	352	330	540	2,595	2,750	3,352	1,176	272	209
MAX	236	272	310	360	355	840	4,360	4,460	5,320	2,720	387	357
MIN	202	222	230	320	320	365	880	1,860	2,360	412	172	168
CFSM	.02	.03	.03	.04	.03	.06	.27	.29	.35	.12	.03	.02
IN.	.03	.03	.03	.04	.04	.07	.30	.33	.39	.14	.03	.02
AC-FT	13,230	14,620	15,360	21,670	18,350	33,180	154,400	169,100	199,500	72,330	16,720	12,420

CAL YR 1969 TOTAL 1,239,384 MEAN 3,396 MAX 56,900 MIN 178 CFSM .36 IN 4.84 AC-FT 2,458,000
WTR YR 1970: TOTAL 373,506 MEAN 1,023 MAX 5,320 MIN 168 CFSM .11 IN 1.46 AC-FT 740,800

05317000 Cottonwood River near New Ulm, Minn.

LOCATION.--Lat 44°17'40", long 94°26'40", in N½ sec.33, T.110 N., R.30 W., Brown County, on left bank 600 ft upstream from highway bridge, 1.8 miles south of New Ulm, and 2 miles upstream from mouth.

DRAINAGE AREA.--1,280 sq mi, approximately

~~RECORDS AVAILABLE~~.--July 1909 to December 1913, March 1931 to March 1938, August 1938 to current year (winter records incomplete prior to 1936).

GAGE.--Water-stage recorder. Datum of gage is 799.09 ft above mean sea level, adjustment of 1912 July 1, 1909, to Dec. 13, 1913, nonrecording gage at site 2.7 miles upstream at different datum. Mar. 15, 1931, to Mar. 31, 1938, nonrecording gage 2.2 miles upstream at datum 11.41 ft higher Aug. 23, 1938, to June 25, 1948, nonrecording gage at present site and datum.

AVERAGE DISCHARGE.--36 years (1911-13, 1935-37, 1938-70), 277 cfs (2.94 inches per year, 200,700 acre-ft per year).

EXTREMES.--Current year: Maximum discharge during year, 2,110 cfs Apr. 8 (gage height, 8.33 ft); minimum daily, 27 cfs, Nov. 19; minimum gage height, 2.45 ft Sept. 1.
Period of record: Maximum discharge, 28,700 cfs Apr. 10, 1969 (gage height, 19.15 ft); maximum gage height, 20.86 ft Apr. 8, 1965 (from floodmark, backwater from ice); minimum observed, 0.5 cfs Nov. 27, 1952; minimum gage height, 0.72 ft Nov. 20, 1964.

REMARKS.--Records good except those for winter periods or periods of no gage height record, which are fair. Some regulation by dam at Cottonwood Lake and several other small lakes above station. Records of water temperatures, and suspended sediment loads for the current year are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 355: 1912.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	40	82	76	57	52	51	210	558	312	177	71	61
2	44	83	77	57	52	51	230	501	382	158	70	163
3	42	83	77	56	52	51	250	462	362	134	80	103
4	40	84	77	56	52	51	275	423	352	116	74	86
5	41	92	76	56	52	51	320	385	322	102	67	74
6	42	97	75	56	52	55	530	355	283	90	64	71
7	44	97	73	56	52	90	900	333	252	84	67	60
8	50	97	72	56	52	130	2,100	315	228	77	74	56
9	49	97	71	56	52	210	1,910	301	207	71	132	55
10	46	97	70	55	52	230	1,480	285	193	66	129	56
11	47	92	68	55	52	220	1,100	263	184	63	215	53
12	51	92	67	55	52	210	863	252	189	87	287	50
13	60	89	65	55	52	195	736	248	189	116	263	46
14	58	50	64	55	52	185	688	248	198	294	226	46
15	58	52	63	55	52	170	724	240	270	385	195	60
16	64	60	62	54	52	165	748	234	296	652	166	58
17	69	54	61	54	52	165	772	228	408	572	143	71
18	70	46	60	54	52	165	740	220	832	420	124	69
19	71	27	60	54	52	165	712	211	1,030	328	121	67
20	74	30	59	54	52	165	744	200	953	265	100	66
21	76	34	59	54	52	170	886	189	772	228	89	62
22	74	39	58	54	52	180	1,010	184	631	200	80	58
23	73	45	58	53	52	190	1,000	180	525	173	70	55
24	69	51	58	53	52	200	962	179	444	150	62	66
25	67	55	58	53	52	210	953	179	375	131	59	67
26	63	61	58	53	51	220	917	173	326	113	56	66
27	63	65	58	53	51	230	863	189	287	100	53	63
28	64	68	58	53	51	230	788	189	254	88	47	62
29	64	71	58	53	------	228	694	202	224	82	45	59
30	69	75	57	53	------	220	603	219	200	82	42	55
31	80	------	57	52	------	215	------	246	------	76	41	------
TOTAL	1,822	2,065	2,010	1,690	1,453	5,068	24,698	8,391	11,480	5,680	3,312	1,984
MEAN	58.8	68.8	64.8	54.5	51.9	163	823	271	383	183	107	66.1
MAX	80	97	77	57	52	230	2,100	558	1,030	652	287	163
MIN	40	27	57	52	51	51	210	173	184	63	41	46
CFSM	.046	.054	.051	.043	.041	.13	.64	.21	.30	.14	.084	.052
IN.	.05	.06	.06	.05	.04	.15	.72	.24	.33	.17	.10	.06
AC-FT	3,610	4,100	3,990	3,350	2,880	10,050	48,990	16,640	22,770	11,270	6,570	3,940

CAL YR 1969 TOTAL 308,359 MEAN 845 MAX 27,100 MIN 27 CFSM .66 IN 8.96 ACFT 611,600
WAT YR 1970 TOTAL 69,653 MEAN 191 MAX 2,100 MIN 27 CFSM .15 IN 2.02 ACFT 138,200

NOTE.--No gage-height record Dec. 22 to Jan. 29, Mar. 9 to Apr. 8.

05318000 East Branch Blue Earth River near Bricelyn, Minn.

LOCATION.--Lat 43°37'50", long 93°47'25", in NE¼NE¼ sec.23, T.102 N., R.25 W., Faribault County, in center of span on downstream side of highway bridge, 2 miles upstream from Brush Creek, 3 miles downstream from South Walnut Lake, and 5 miles northeast of Bricelyn.

DRAINAGE AREA.--132 sq mi.

PERIOD OF RECORD.--March 1951 to September 1970 (discontinued). Prior to October 1957, published as East Fork Blue Earth River near Bricelyn.

GAGE.--Nonrecording gage read twice daily. Datum of gage is 1,131.86 ft above mean sea level, datum of 1929 (Minnesota State Highway Department bench mark).

AVERAGE DISCHARGE.--19 years, 41.2 cfs (4.24 inches per year).

EXTREMES.--Current year: Maximum discharge, about 140 cfs about May 29; no flow on many days.
Period of record: Maximum discharge, 1,320 cfs Apr. 7, 1951 (gage height, 10.68 ft, from graph based on gage readings); maximum gage height, 11.70 ft Apr. 7, 1965; no flow on many days in most years.

REMARKS.--Records good except those for winter periods or periods of no gage-height record, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.90	8.4	8.6	2.8		0	58	102	72	14	.20	0
2	3.6	9.8	8.4	2.4		0	60	100	66	13	.10	0
3	6.3	11	8.2	2.0		0	58	99	62	10	.10	0
4	7.8	12	8.2	1.8		0	62	93	60	7.5	.10	0
5	9.5	13	8.2	1.5		0	66	88	59	5.6	0	.30
6	11	12	8.0	1.3		0	72	83	58	4.8	0	.50
7	10	12	9.6	1.0		0	81	77	57	4.8	0	1.1
8	10	12	12	.80		0	90	68	56	3.9	.10	1.2
9	9.5	12	14	.60		0	97	61	54	3.1	.20	.90
10	7.8	12	16	.50		0	104	56	54	2.5	.20	.90
11	6.9	12	15	.40		0	104	52	53	2.2	.20	1.6
12	6.9	12	15	.30		0	102	50	54	1.5	.10	1.1
13	7.5	10	15	.30		0	104	57	54	2.2	.10	1.3
14	8.8	9.8	15	.30		0	104	73	54	2.8	0	1.2
15	8.1	9.4	15	.20		0	104	91	55	2.3	0	1.9
16	8.4	9.4	15	.20		.10	106	111	56	2.0	0	2.8
17	9.1	9.8	16	.20		.20	108	105	56	1.3	0	3.9
18	9.8	12	17	.20		.30	112	93	55	.90	0	4.5
19	10	15	17	.20		.40	113	75	58	.10	0	4.8
20	11	14	16	.10		.60	114	55	56	.20	0	5.1
21	11	13	15	.10		.80	115	58	52	.20	0	6.0
22	9.8	12	13	.10		1.1	124	64	48	0	0	6.3
23	8.4	11	12	0		1.5	129	77	44	0	0	5.7
24	7.8	10	10	0		5.8	133	92	38	0	0	6.6
25	6.3	10	8.4	0		35	131	110	34	0	0	9.8
26	6.0	9.4	7.5	0		84	127	121	29	0	0	16
27	6.3	9.0	6.4	0		74	120	90	27	0	0	21
28	5.4	9.0	5.4	0		66	114	76	23	0	0	23
29	4.8	8.8	4.4	0	------	61	108	140	19	0	0	23
30	4.8	8.7	3.8	0	------	58	107	110	16	.10	0	23
31	7.2	------	3.3	0	------	56	------	78	------	.20	0	------
TOTAL	240.70	328.5	346.4	17.30	0	444.80	3,027	2,605	1,479	85.20	1.40	173.50
MEAN	7.76	11.0	11.2	.56	0	14.3	101	84.0	49.3	2.75	.045	5.78
MAX	11	15	17	2.8	0	84	133	140	72	14	.20	23
MIN	.90	8.4	3.3	0	0	0	58	50	16	0	0	0
CFSM	.059	.083	.085	.004	0	.11	.77	.64	.37	.021	.0003	.044
IN.	.07	.09	.10	.004	0	.13	.85	.73	.42	.02	0	.05

CAL YR 1969 TOTAL 26,232.36 MEAN 71.9 MAX 773 MIN .04 CFSM .54 IN 7.39
WAT YR 1970 TOTAL 8,748.80 MEAN 24.0 MAX 140 MIN 0 CFSM .18 IN 2.47

NOTE.--No gage-height record Jan. 4-27, Jan. 29 to Mar. 22, May 17 to June 11.

05320000 Blue Earth River near Rapidan, Minn.

LOCATION.--Lat 44°05'44", long 94°06'33", in SE¼SE¼ sec.6, T.107 N., R.27 W., Blue Earth County, on left bank 0.2 mile downstream from abandoned powerplant of Northern States Power Co., 2 miles west of Rapidan, 3.5 miles downstream from Watonwan River, and 7.8 miles upstream from LeSueur River.

DRAINAGE AREA.--2,430 sq mi approximately.

PERIOD OF RECORD.--July 1909 to November 1910 (no winter records), October 1939 to September 1945, July 1949 to current year. Published as "at Rapidan Mills" 1909-10.

GAGE.--Water-stage recorder. Datum of gage is 808.80 ft above mean sea level, adjustment of 1912. July 20, 1909, to Apr. 28, 1910, nonrecording gage at site 0.2 mile upstream at different datum. Apr. 29 to Nov. 12, 1910, nonrecording gage at site 800 ft upstream at different datum. Oct. 4 to Nov. 14, 1939, nonrecording gage at present site and datum.

AVERAGE DISCHARGE.--27 years (1939-45, 1949-70), 826 cfs (4.62 inches per year, 598,400 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 3,460 cfs May 16 (gage height, 5.26 ft), minimum, 57 cfs Aug. 31 (gage height, 1.41 ft).
Period of record: Maximum discharge, 43,100 cfs Apr. 9, 1965 (gage height, 21.36 ft, from floodmark); minimum, 6.9 cfs Oct. 12, 1955 (gage height, 1.04 ft).

REMARKS.--Records good except those for winter periods, which are fair. Flow regulated by Rapidan Reservoir. Rapidan Reservoir gates destroyed during April 1965 flood and not replaced. Capacity reduced to an undetermined figure. Regulation discontinued with closing of Northern States Power Co. plant on Dec. 31, 1966.

REVISIONS (WATER YEARS).--WSP 895: Drainage area. WSP 1508: 1910.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	110	162	149	100	96	91	540	1,540	1,350	405	229	89
2	107	178	150	101	96	93	560	1,480	1,290	363	208	130
3	106	188	149	101	97	108	630	1,450	1,190	328	184	123
4	100	196	147	102	94	116	720	1,410	1,100	297	165	111
5	101	209	142	100	91	123	961	1,320	1,020	271	147	108
6	105	217	141	100	90	117	1,260	1,240	938	251	144	102
7	123	217	130	100	89	125	1,730	1,150	881	233	147	87
8	121	221	115	100	88	175	2,170	1,070	828	220	165	77
9	114	217	109	92	87	300	2,340	1,030	762	219	158	74
10	107	212	114	92	86	460	2,340	977	714	219	162	80
11	109	205	120	92	86	455	2,080	906	693	201	165	80
12	113	201	130	92	87	430	1,750	845	662	199	162	82
13	124	191	140	92	88	405	1,570	816	645	214	154	77
14	119	117	130	92	88	385	1,520	1,400	628	270	147	77
15	124	128	127	90	90	380	1,550	2,900	643	560	137	90
16	140	148	126	87	90	380	1,620	3,420	706	540	130	93
17	139	170	125	87	90	365	1,630	3,070	1,320	418	120	117
18	140	138	126	87	88	360	1,580	2,580	1,690	343	114	123
19	147	99	123	87	84	360	1,550	2,270	1,490	322	120	130
20	151	130	117	87	86	380	1,730	2,040	1,320	293	105	123
21	151	140	118	87	87	415	2,060	1,840	1,190	264	99	120
22	151	155	117	87	87	425	2,220	1,670	1,100	251	93	114
23	145	155	111	87	88	410	2,230	1,500	1,030	238	87	111
24	139	152	109	87	89	410	2,260	1,380	909	221	82	119
25	137	152	107	87	89	430	2,300	1,320	808	212	80	129
26	138	152	107	87	90	470	2,180	1,450	719	200	74	140
27	134	150	104	70	90	460	1,990	1,590	641	208	69	155
28	133	149	102	94	91	470	1,830	1,530	569	181	64	166
29	134	148	99	94	------	490	1,760	1,420	504	200	62	158
30	135	169	100	96	------	520	1,660	1,380	450	208	60	151
31	151	------	104	96	------	540	------	1,380	------	225	57	------
TOTAL	3,948	5,066	3,788	2,853	2,502	10,648	50,321	49,374	27,790	8,574	3,890	3,336
MEAN	127	169	122	92.0	89.4	343	1,677	1,593	926	277	125	111
MAX	151	221	150	102	97	540	2,340	3,420	1,690	560	229	166
MIN	100	99	99	70	84	91	540	816	450	181	57	74
CFSM	.05	.07	.05	.04	.04	.14	.69	.66	.38	.11	.05	.05
IN.	.06	.08	.06	.04	.04	.16	.77	.76	.43	.13	.06	.05
AC-FT	7,830	10,050	7,510	5,660	4,960	21,120	99,810	97,930	55,120	17,010	7,720	6,620

CAL YR 1969 TOTAL 634,004 MEAN 1,737 MAX 20,900 MIN 99 CFSM .71 IN 9.70 AC-FT 1,258,000
WTR YR 1970: TOTAL 172,090 MEAN 471 MAX 3,420 MIN 57 CFSM .19 IN 2.63 AC-FT 341,300

05320500 Le Sueur River near Rapidan, Minn.

LOCATION.--Lat 44°06'40", long 94°02'28", in SW¼ sec.35, T.108 N., R.27 W., Blue Earth County, on right bank 600 ft downstream from highway bridge, 1.8 miles northeast of Rapidan, and 2.3 miles upstream from mouth.

DRAINAGE AREA.--1,100 sq mi, approximately.

PERIOD OF RECORD.--October 1939 to September 1945, July 1949 to current year.

GAGE.--Water-stage recorder. Datum of gage is 775,76 ft above mean sea level, datum of 1929. Prior to Nov. 15, 1939, nonrecording gage at same site and datum.

AVERAGE DISCHARGE.--27 years, 410 cfs (5.06 inches per year, 297,000 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 2,260 cfs May 16 (gage height, 5.82 ft); minimum, 21 cfs Aug. 31 (gage height, 1.22 ft).
Period of record: Maximum discharge, 24,700 cfs Apr. 8, 1965 (gage height, 22.10 ft, from floodmark); maximum gage height, 22.72 ft May 22, 1960 (from floodmark); minimum daily discharge, 1.6 cfs Feb. 9-25, 1959; minimum gage height, 1.22 ft Aug. 31, 1970.

REMARKS.--Records good except those for winter periods, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	19	45	44	52	64	50	260	787	910	284	287	37
2	19	50	44	54	64	50	378	782	910	253	253	70
3	18	53	43	55	64	50	439	765	844	230	196	69
4	16	58	42	56	64	50	448	726	760	200	160	70
5	22	61	40	56	63	51	610	670	680	176	136	74
6	22	61	24	56	63	51	814	615	601	158	120	69
7	21	67	23	56	63	51	1,040	565	538	146	111	58
8	24	65	25	56	63	52	1,290	524	480	134	115	49
9	25	63	28	57	62	52	1,250	488	422	120	111	43
10	21	61	32	57	62	52	1,110	457	378	106	106	44
11	20	58	33	58	62	53	958	452	350	98	111	40
12	21	58	33	59	61	53	832	430	343	98	109	34
13	36	42	34	60	61	54	776	402	329	115	100	31
14	36	30	34	61	61	54	776	466	336	237	87	31
15	32	44	34	63	61	55	809	1,340	374	240	74	41
16	41	51	34	63	60	56	856	2,210	618	198	67	52
17	36	45	34	62	60	58	844	2,120	1,110	168	61	70
18	36	42	34	62	59	59	792	1,830	1,310	143	54	76
19	39	41	34	61	58	61	844	1,640	1,230	117	51	82
20	43	39	34	60	57	64	1,200	1,470	1,160	102	46	82
21	37	37	35	59	56	69	1,340	1,280	1,080	91	41	82
22	37	36	36	60	55	75	1,330	1,120	982	82	38	82
23	36	37	37	62	54	83	1,320	976	856	74	34	104
24	34	40	39	63	53	92	1,290	862	716	65	31	138
25	37	45	40	63	52	104	1,260	804	592	58	28	158
26	37	46	43	63	51	112	1,150	732	516	52	26	259
27	36	46	44	64	51	128	1,040	726	448	84	24	332
28	36	46	46	64	50	140	970	776	414	87	22	366
29	36	45	47	64	------	155	886	862	386	126	22	346
30	36	44	49	64	------	178	804	958	329	183	21	304
31	45	------	51	64	------	208	------	832	------	216	20	------
TOTAL	954	1,456	1,150	1,854	1,654	2,420	27,716	28,667	20,002	4,441	2,662	3,293
MEAN	30.8	48.5	37.1	59.8	59.1	78.1	924	925	667	143	85.9	110
MAX	45	67	51	64	64	208	1,340	2,210	1,310	284	287	366
MIN	16	30	23	52	50	50	260	402	329	52	20	31
CFSM	.03	.04	.03	.05	.05	.07	.84	.84	.61	.13	.08	.10
IN.	.03	.05	.04	.06	.06	.08	.94	.97	.68	.15	.09	.11
AC-FT	1,890	2,890	2,280	3,680	3,280	4,800	54,970	56,860	39,670	8,810	5,280	6,530

CAL YR 1969 TOTAL 263,631 MEAN 722 MAX 10,700 MIN 16 CFSM .66 IN 8.92 AC-FT 522,900
WTR YR 1970 TOTAL 96,269 MEAN 264 MAX 2,210 MIN 16 CFSM .24 IN 3.26 AC-FT 190,900

PEAK DISCHARGE (BASE, 1,300 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
4-8	1530	4.47	1,350	5-16	1500	5.83	2,270
4-21	1200	4.48	1,350	6-18	1500	4.44	1,330

05325000 Minnesota River at Mankato, Minn.

LOCATION.--Lat 44°10'10", long 94°00'15", in sec.7, T.108 N., R.26 W., Nicollet County, on left bank at downstream side of Main Street Bridge in Mankato, 1.8 miles downstream from Blue Earth River and at mile 106.4 upstream from Mississippi River.

DRAINAGE AREA.--14,900 sq mi, approximately.

PERIOD OF RECORD.--May 1903 to current year (no winter records 1904, 1906-10, 1918-29). Monthly discharge only for some periods, published in WSP 1308. Published as "near Mankato" 1903-21.

GAGE.--Water-stage recorder. Datum of gage is 747.92 ft above mean sea level, datum of 1929. Prior to Oct. 19, 1921, nonrecording gage, at site 1.8 miles upstream at datum 6.4 ft higher. Mar. 15, 1922, to Nov. 30, 1924, nonrecording gage at present site and datum.

AVERAGE DISCHARGE.--49 years (1905, 1910-17, 1929-70), 2,609 cfs (2.38 inches per year, 1,890,000 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 8,680 cfs Apr. 25 (gage height, 9.64 ft); minimum, 254 cfs Nov. 19 (gage height, 2.26 ft); minimum gage height, 2.14 ft Sept. 1.
Period of record: Maximum discharge, 94,100 cfs Apr. 10, 1965 (gage height, 2909 ft); minimum observed, 26 cfs Aug. 4, 1934.
Maximum stage known, 29.9 ft Apr. 26, 1881, from floodmark, present site and datum (discharge, 90,000 cfs).

REMARKS.--Records good except those for winter periods, which are fair. Records of water temperatures and suspended sediment loads for the current year are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 875: 1917. WSP 955: Drainage area. WSP 1085: 1929. WSP 1238: 1903, 1908, 1919. WSP 1508: 1916(M), 1918(M), 1926(M), 1928, 1930, 1932(M), 1938(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	395	511	520	435	565	500	2,200	7,930	4,620	3,950	1,200	349
2	395	529	520	440	565	500	2,420	7,730	4,780	3,790	1,110	504
3	374	547	510	450	565	500	2,660	7,580	4,760	3,510	993	762
4	353	556	505	450	565	555	2,800	7,400	4,500	3,250	905	685
5	360	575	500	455	565	555	3,090	7,140	4,190	3,010	828	718
6	374	603	490	455	560	555	3,730	6,800	3,910	2,780	762	718
7	381	613	480	455	560	565	4,800	6,340	3,710	2,550	740	674
8	388	622	475	455	560	595	6,700	6,050	3,580	2,370	784	587
9	381	622	465	455	555	650	7,860	5,680	3,440	2,130	762	531
10	381	622	450	460	550	770	7,910	5,270	3,270	1,850	795	504
11	395	603	445	465	545	970	7,500	4,850	3,130	1,620	784	431
12	427	594	460	470	540	1,080	6,930	4,510	3,050	1,540	872	401
13	467	584	480	475	540	1,090	6,540	4,250	3,030	1,750	982	368
14	443	484	490	480	540	1,080	6,180	4,490	3,170	2,130	960	349
15	435	435	485	485	540	1,060	6,010	6,040	3,310	2,880	905	401
16	475	484	480	490	535	1,030	6,140	7,840	3,570	2,950	828	401
17	467	538	480	490	535	1,010	6,250	7,680	4,550	2,830	729	495
18	459	493	485	490	530	1,000	6,210	6,800	6,100	2,420	674	504
19	467	309	460	490	530	1,010	6,330	6,140	6,840	2,060	663	522
20	484	395	425	490	530	1,040	6,990	5,600	7,190	1,730	631	513
21	493	475	410	490	530	1,100	7,610	5,160	7,310	1,520	558	513
22	484	493	405	490	530	1,150	8,000	4,810	7,500	1,390	522	495
23	459	493	415	490	530	1,200	8,280	4,400	7,420	1,290	478	495
24	443	502	420	495	525	1,270	8,500	4,070	7,190	1,190	439	546
25	443	500	425	515	520	1,340	8,660	3,950	6,790	1,130	408	612
26	451	500	425	535	500	1,500	8,590	3,800	6,330	1,060	388	704
27	435	500	425	550	500	1,580	8,430	3,910	5,770	1,130	368	833
28	411	505	425	560	500	1,680	8,390	4,070	5,210	1,050	349	894
29	411	515	425	565	------	1,750	8,250	4,380	4,710	1,060	337	875
30	427	520	430	565	------	1,880	8,080	4,630	4,240	1,170	331	812
31	493	------	430	565	------	2,020	------	4,540	------	1,240	320	------
TOTAL	13,251	15,722	14,240	15,155	15,110	32,585	192,040	173,840	147,170	64,330	21,405	17,196
MEAN	427	524	459	489	540	1,051	6,401	5,608	4,906	2,075	690	573
MAX	493	622	520	565	565	2,020	8,660	7,930	7,500	3,950	1,200	894
MIN	353	309	405	435	500	500	2,200	3,800	3,030	1,050	320	349
CFSM	.03	.04	.03	.03	.04	.07	.43	.38	.33	.14	.05	.04
IN.	.03	.04	.04	.04	.04	.08	.48	.43	.37	.16	.05	.04
AC-FT	26,280	31,180	28,250	30,060	29,970	64,630	380,900	344,800	291,900	127,600	42,460	34,110

CAL YR 1969 TOTAL 2,526,417 MEAN 6,922 MAX 76,200 MIN 309 CFSM .46 IN 6.31 AC-FT 5,011,000
WTR YR 1970: TOTAL 722,044 MEAN 1,978 MAX 8,660 MIN 309 CFSM .13 IN 1.80 AC-FT 1,432,000

05330000 Minnesota River near Jordan, Minn.

LOCATION.--Lat 44°41'35", long 93°38'30", in NW¼SW¼ sec.7, T.114 N., R.23 W., Carver County, on left bank 1.5 miles northwest of Jordan and at mile 39.4 upstream from Mississippi River.

DRAINAGE AREA.--16,200 sq mi, approximately.

PERIOD OF RECORD.--September 1934 to current year. Prior to Oct. 1, 1966, published as "near Carver, Minn".

GAGE.--Water-stage recorder. Datum of gage is 690.00 ft above mean sea level, datum of 1929. Auxiliary water-stage recorder 2.8 miles downstream at same datum. Prior to Oct. 1, 1966, water-stage recorder 2.8 miles downstream with auxiliary ~~chain~~ gage at present site and same datum.

AVERAGE DISCHARGE.--3~~5~~ 6 years, 3,306 cfs (2.77 inches per year, 2,395,000 acre-ft).

EXTREMES.--Current year: Maximum discharge, 9,510 cfs Apr. 25 (gage height, 15.09 ft); minimum daily, 459 cfs Oct. 9, 10; minimum gage height, 4.25 ft Sept. 1.
Period of record: Maximum discharge, 117,000 cfs Apr. 11, 1965; maximum gage height, 34.37 ft Apr. 12, 1965 (backwater from Mississippi River); minimum discharge, 79 cfs Nov. 17, 1955; minimum gage height, 2.66 ft Nov. 22, 1935.

REMARKS.--Records good except for winter periods, which are fair. Records of chemical analyses for the current year are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 955: Drainage area. WSP 1508: 1935.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	504	598	545	640	675	660	2,390	9,090	5,430	4,360	1,330	495
2	522	621	545	640	675	660	2,580	8,960	5,410	4,060	1,370	500
3	513	630	545	640	670	660	2,760	8,830	5,440	3,770	1,340	545
4	504	644	545	640	670	660	3,000	8,600	5,390	3,500	1,230	708
5	513	652	545	640	670	660	3,350	8,310	5,180	3,280	1,130	829
6	495	662	545	640	670	660	3,680	7,960	4,810	3,090	1,060	840
7	495	684	540	640	670	660	4,180	7,600	4,510	2,920	1,010	840
8	468	702	535	640	670	665	5,710	7,190	4,290	2,720	983	813
9	459	711	510	640	670	670	7,600	6,780	4,130	2,540	967	785
10	459	720	515	640	670	690	8,420	6,390	3,980	2,330	956	747
11	495	720	530	645	665	760	8,650	5,970	3,820	2,120	939	681
12	464	716	550	645	665	840	8,420	5,530	3,700	1,940	956	637
13	504	706	565	645	665	1,250	7,890	5,160	3,630	1,810	961	575
14	526	689	580	645	665	1,380	7,450	4,910	3,620	1,860	1,030	540
15	549	670	595	645	665	1,440	7,070	4,970	3,690	2,040	1,090	545
16	567	612	605	650	665	1,490	6,870	5,420	3,870	2,600	1,060	535
17	558	576	610	650	665	1,520	6,810	7,330	4,070	2,970	1,010	575
18	562	540	620	650	665	1,540	6,820	7,740	4,640	2,950	945	600
19	572	530	625	655	665	1,560	6,970	7,260	5,840	2,810	895	642
20	567	510	635	655	665	1,580	7,850	6,540	6,710	2,440	857	653
21	572	500	640	660	660	1,600	8,600	5,970	7,130	2,120	818	675
22	572	500	640	665	660	1,640	8,850	5,510	7,330	1,870	791	664
23	572	520	640	665	660	1,690	9,100	5,130	7,380	1,700	736	642
24	567	530	640	670	660	1,750	9,380	4,780	7,360	1,570	692	648
25	567	535	640	670	660	1,800	9,470	4,490	7,170	1,470	653	670
26	558	540	645	670	660	1,850	9,500	4,300	6,900	1,380	620	709
27	544	545	645	670	660	1,900	9,430	4,240	6,430	1,340	595	754
28	536	545	645	670	660	1,980	9,330	4,670	5,880	1,310	565	814
29	531	545	640	675	------	2,010	9,370	5,050	5,320	1,310	642	910
30	536	545	640	675	------	2,110	9,250	5,250	4,790	1,310	570	960
31	567	------	640	675	------	2,220	------	5,420	------	1,320	510	------
TOTAL	16,418	18,198	18,340	20,250	18,640	40,555	210,750	195,350	157,850	72,810	28,311	20,531
MEAN	530	607	592	653	666	1,308	7,025	6,302	5,262	2,349	913	684
MAX	572	720	645	675	675	2,220	9,500	9,090	7,380	4,360	1,370	960
MIN	459	500	510	640	660	660	2,390	4,240	3,620	1,310	510	495
CFSM	.03	.04	.04	.04	.04	.08	.43	.39	.32	.14	.06	.04
IN.	.04	.04	.04	.05	.04	.09	.48	.45	.36	.17	.06	.05
AC-FT	32,570	36,100	36,380	40,170	36,970	80,440	418,000	387,500	313,100	144,400	56,150	40,720

CAL YR 1969 TOTAL 2,755,654 MEAN 7,550 MAX 84,500 MIN 459 CFSM .47 IN 6.33 AC-FT 5,466,000
WTR YR 1970: TOTAL 818,003 MEAN 2,241 MAX 9,500 MIN 459 CFSM .14 IN 1.88 AC-FT 1,623,000

05330900 Nine Mile Creek at Bloomington, Minn.

LOCATION.--Lat 44°48'46", long 93°18'07", in NW¼ sec.21, T.27 N., R.24 W., Hennepin County, on left bank between 105th and 106th Street in Bloomington, [redacted] 1.2 miles downstream from bridge on Old Shakopee Road and 2.1 miles upstream from mouth.

RECORDS AVAILABLE.--January 1963 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 731 ft (from topographic map). Prior to May 16, 1963, nonrecording gage 30 ft upstream at datum 0.81 ft higher.

AVERAGE DISCHARGE.--7 years, 17.2 cfs (12,460 acre-ft per year).

EXTREMES.--Current year: Maximum discharge, 209 cfs May 31 (gage height, 3.38 ft); minimum daily discharge, 2.9 cfs Jan. 12-26.
Period of record: Maximum discharge, 535 cfs Apr. 8, 1965 (gage height, 4.32 ft); minimum daily, 1.2 cfs Feb. 24, 1965; minimum gage height, 1.28 ft Oct. 14, 1966.

REMARKS.--Records good except those for periods of no gage-height record and those for winter periods, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	5.4	6.0	5.6	4.4	3.2	3.5	32	55	58	7.9	19	11
2	5.2	6.5	5.5	4.2	3.2	3.5	35	45	45	13	13	7.8
3	5.1	5.6	5.0	4.0	3.2	3.5	27	36	32	10	11	9.5
4	4.7	4.9	5.4	3.9	3.2	3.5	25	28	26	8.8	8.8	8.0
5	5.1	4.6	5.4	3.8	3.2	3.5	27	22	24	7.3	7.9	6.2
6	5.4	4.4	5.6	3.6	3.2	3.5	28	20	21	7.3	7.9	15
7	5.4	4.8	5.5	3.5	3.2	3.5	28	20	17	7.3	8.8	18
8	4.9	4.9	5.4	3.4	3.3	3.5	32	17	13	6.8	12	15
9	5.3	5.0	5.1	3.2	3.3	3.5	29	17	11	7.9	11	15
10	5.3	5.7	5.2	3.1	3.3	3.5	25	17	9.2	7.3	7.9	17
11	5.9	5.7	5.4	3.0	3.3	3.5	23	15	8.2	6.8	7.2	15
12	8.8	5.8	5.7	2.9	3.3	3.5	23	15	11	8.8	6.3	10
13	8.7	5.6	5.9	2.9	3.3	3.5	25	14	10	8.8	6.5	7.0
14	6.6	5.0	5.7	2.9	3.3	3.5	25	19	9.0	13	6.7	8.6
15	9.8	5.5	5.6	2.9	3.4	3.5	25	18	8.0	12	8.1	17
16	7.0	5.8	5.5	2.9	3.5	3.7	25	14	7.8	12	6.9	15
17	6.4	5.7	5.7	2.9	3.5	4.0	24	11	7.6	7.3	5.3	22
18	5.0	5.4	5.8	2.9	3.5	4.5	23	11	7.6	17	5.0	18
19	4.6	5.0	5.8	2.9	3.5	5.0	40	10	7.5	45	5.3	13
20	4.3	4.8	5.7	2.9	3.5	6.0	50	11	8.0	42	5.0	8.8
21	4.4	5.0	5.7	2.9	3.5	7.0	52	10	7.8	38	4.9	9.6
22	4.4	5.0	5.5	2.9	3.5	9.0	58	32	7.6	30	4.7	8.3
23	4.3	5.4	5.2	2.9	3.5	13	55	31	7.4	22	4.8	8.2
24	4.1	6.7	5.0	2.9	3.5	25	50	42	7.3	19	4.8	16
25	4.1	5.9	4.9	2.9	3.5	27	44	35	14	15	5.0	22
26	4.2	5.8	4.8	2.9	3.5	29	35	24	13	15	5.1	20
27	4.2	5.6	4.7	3.0	3.5	30	29	33	12	24	4.8	18
28	4.1	5.7	4.6	3.0	3.5	29	28	50	9.6	27	5.8	14
29	4.1	5.3	4.5	3.1	------	28	40	50	8.8	25	20	10
30	5.7	5.6	4.5	3.1	------	27	54	48	7.9	28	17	8.8
31	6.1	------	4.4	3.2	------	28	------	73	------	24	15	------
TOTAL	168.6	162.7	164.3	99.0	94.4	327.7	1,016	843	436.3	523.3	261.5	391.8
MEAN	5.44	5.42	5.30	3.19	3.37	10.6	33.9	27.2	14.5	16.9	8.44	13.1
MAX	9.8	6.7	5.9	4.4	3.5	30	58	73	58	45	20	22
MIN	4.1	4.4	4.4	2.9	3.2	3.5	23	10	7.3	6.8	4.7	6.2
AC-FT	334	323	326	196	187	650	2,020	1,670	865	1,040	519	777

CAL YR 1969 TOTAL 5,042.3 MEAN 13.8 MAX 100 MIN 4.1 AC-FT 10,000
WTR YR 1970 TOTAL 4,488.6 MEAN 12.3 MAX 73 MIN 2.9 AC-FT 8,900

NOTE.--No gage-height record Dec. 23 to Mar. 23, June 8-24.

05331000 Mississippi River at St. Paul, Minn.

LOCATION.--Lat 44°56'40", long 93°05'20", in SE¼NE¼ sec.6, T.28 N., R.22 W., on left bank in St. Paul, 300 ft upstream from Robert Street bridge, 6 miles downstream from Minnesota River, and at mile 839.3 upstream from Ohio River.

DRAINAGE AREA.--36,800 sq mi, approximately.

PERIOD OF RECORD.--Water years 1867-69, 1872-92 (annual maximum), March 1892 to current year (prior to 1901, fragmentary during some winters). Records prior to March 1892, published in the 19th Annual Report, Part 4, have been found to be unreliable and should not be used. Monthly discharge only for some periods, published in WSP 1308. Gage-height records (winter records incomplete) collected at same site since 1866 are contained in reports of U. S. Weather Bureau, War Department and Mississippi River Commission.

GAGE.--Water-stage recorder. Datum of gage is 684.16 ft above mean sea level, adjustment of 1912. Prior to Mar. 18, 1925, nonrecording gage at several sites within 300 ft of present site at same datum. Mar. 18, 1925, to Mar. 10, 1933, water-stage recorder and Mar. 11, 1933, to Sept. 14, 1939, nonrecording gage, at present site and datum. Since September 1938, auxiliary water-stage recorder 5.4 miles downstream.

AVERAGE DISCHARGE (ADJUSTED FOR DIVERSION).--72 years (1894-95, 1896-97, 1900-1970, 10,230 cfs (3.78 inches per year).

EXTREMES.--Current year: Maximum discharge, 35,800 cfs Apr. 29 (gage height, 7.90 ft); minimum daily, 1,690 cfs Sept. 19.

Period of record (1867-69, 1872-1970): Maximum discharge, 171,000 cfs Apr. 16, 1965 (gage height, 26.01 ft, from floodmark).

Period of record (1897, 1917-70): Minimum daily discharge, 632 cfs Aug. 26, 1934.

Maximum stage known since at least 1851, that of Apr. 16, 1965. Flood of Apr. 11, 1870 reached a stage of 19.4 ft (discharge, 100,000 cfs).

REMARKS.--Records good. Records of water temperatures for the current year are published in Part 2 of this report. Slight regulation except during extreme floods by reservoirs on headwaters and by powerplants. Beginning July 20, 1938, sewage from Minneapolis and St. Paul, which formerly entered above station, was diverted to a sewage-disposal plant, thence to river below station. Figures of daily discharge do not include this diversion.

COOPERATION.--Records of Mississippi River at Twin City lock and dam computed and furnished by Ford Motor Co. Gage-height record at South St. Paul furnished by Corps of Engineers. Diversion through sewage disposal plant furnished by Minneapolis-St. Paul Sanitary District.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	4,010	5,840	5,210	5,810	5,110	5,010	8,370	34,100	17,200	13,100	3,820	2,000
2	4,070	5,850	6,120	5,670	5,140	4,810	8,550	33,900	17,600	13,000	4,080	1,790
3	3,390	5,640	5,900	5,190	5,240	5,800	9,300	33,600	17,600	12,200	3,640	1,860
4	3,540	5,340	4,950	5,610	4,820	5,230	9,690	32,700	17,500	10,400	3,590	2,080
5	3,820	5,570	4,670	5,290	5,240	5,300	9,960	31,700	17,600	9,510	3,510	2,010
6	4,280	5,740	5,200	4,710	5,190	4,970	10,600	30,000	16,500	9,490	3,250	2,220
7	4,140	5,580	5,090	4,510	5,160	5,270	10,700	28,700	15,800	8,920	3,550	2,390
8	3,780	6,020	4,910	4,750	5,120	5,230	14,400	27,900	15,100	8,030	3,450	2,250
9	5,250	6,160	4,930	4,890	5,160	4,900	18,300	26,800	13,700	8,050	3,510	2,310
10	5,480	5,920	4,660	5,620	5,310	5,020	20,100	25,800	13,600	7,970	2,940	2,080
11	4,690	5,870	4,920	5,390	5,490	5,240	23,500	24,600	13,000	7,180	2,830	2,230
12	5,190	5,860	4,370	5,110	5,300	5,860	26,100	23,900	12,600	6,890	3,320	2,240
13	5,470	6,240	4,570	5,180	5,030	5,620	26,700	22,300	13,200	6,870	3,240	1,840
14	5,510	6,250	5,560	5,180	4,740	5,390	26,700	21,000	12,800	6,790	3,210	2,200
15	5,150	7,130	4,320	5,180	5,010	5,540	26,200	20,300	12,400	5,780	3,400	2,260
16	5,430	5,260	4,000	5,280	5,180	5,740	26,200	20,600	13,900	5,980	3,040	2,030
17	5,520	4,510	3,760	5,340	4,840	6,300	25,000	19,100	14,800	6,360	2,690	2,020
18	4,970	5,300	4,610	5,080	4,850	6,820	24,600	20,900	15,300	7,350	2,800	2,400
19	5,430	5,100	5,020	5,080	5,110	6,280	25,000	21,600	17,300	7,420	2,860	1,690
20	5,200	4,020	4,700	4,970	4,780	5,890	25,700	20,800	18,100	6,640	2,400	2,260
21	5,460	3,700	4,950	5,150	4,570	6,170	26,700	18,200	18,900	6,190	2,190	2,370
22	5,010	4,060	5,330	5,280	4,570	6,340	27,300	19,400	19,000	5,060	2,430	2,220
23	5,050	4,260	4,700	5,270	4,550	6,360	28,300	17,200	18,900	5,150	1,910	2,840
24	5,150	4,280	4,510	5,190	4,910	6,600	29,100	16,200	18,000	5,380	2,160	2,350
25	5,400	4,850	4,600	4,960	5,140	6,910	30,200	16,000	17,400	4,750	1,960	2,550
26	5,290	5,760	5,030	5,120	4,810	7,030	31,400	15,600	16,700	4,980	1,890	2,140
27	5,100	5,270	4,970	5,060	4,910	7,260	31,600	15,000	16,200	5,300	1,970	2,140
28	5,000	4,760	4,970	5,150	4,700	7,330	33,300	15,800	15,500	5,140	1,860	1,900
29	5,130	4,980	5,100	5,100	------	7,690	33,900	15,700	15,400	5,080	2,490	2,640
30	5,020	4,800	5,100	5,180	------	7,530	34,100	16,600	14,700	4,560	2,310	2,540
31	5,000	------	5,450	5,180	------	7,640	------	17,200	------	4,380	2,230	------
TOTAL	150,930	159,920	152,180	160,480	139,980	187,080	681,570	703,200	476,300	223,900	88,530	65,850
MEAN	4,869	5,331	4,909	5,177	4,999	6,035	22,720	22,680	15,880	7,223	2,856	2,195
MAX	5,520	7,130	6,120	5,810	5,490	7,690	34,100	34,100	19,000	13,100	4,080	2,840
MIN	3,390	3,700	3,760	4,510	4,550	4,810	8,370	15,000	12,400	4,380	1,860	1,690
(≠)	331	300	287	285	304	328	348	353	382	386	377	355
MEAN ≠	5,200	5,631	5,196	5,462	5,303	6,363	23,070	23,030	16,260	7,609	3,233	2,550
CFSM ≠	0.14	0.15	0.14	0.15	0.14	0.17	0.63	0.63	0.44	0.21	0.09	0.07
IN. ≠	0.16	0.17	0.16	0.17	0.15	0.20	0.70	0.73	0.49	0.24	0.10	0.08

CAL YR 1969 TOTAL 6,580,960 MEAN 18,030 MAX 154,000 MIN 2,650 MEAN ≠ 18,340 CFSM ≠ 0.50 IN. ≠ 6.90
WTR YR 1970 TOTAL 3,189,920 MEAN 8,740 MAX 34,100 MIN 1,690 MEAN ≠ 9,077 CFSM ≠ 0.25 IN. ≠ 3.35

≠ Diversion, equivalent in cubic feet per second, through sewage disposal plant.
≠ Adjusted for diversion.

05336200 Glaisby Brook near Kettle River, Minn.

LOCATION.--Lat 46°27'19", long 92°51'34", in SE¼NW¼ sec.22, T.46 N., R.20 W., Carlton County, on left bank 20 ft upstream from bridge No. 2468 on State Highways 27 and 73, 1.0 mile upstream from mouth, and 2.4 miles south of Kettle River.

DRAINAGE AREA.--24.2 sq mi.

PERIOD OF RECORD.--October 1959 to September 1970 (discontinued as continuous-record station; converted to a crest-stage partial-record station).

GAGE.--Water-stage recorder. Altitude of gage is 1,105 ft (from topographic map).

AVERAGE DISCHARGE.--11 years, 20.0 cfs (11.22 inches per year).

EXTREMES.--Current year: Maximum discharge, 320 cfs Apr. 25 (gage height, 4.97 ft); minimum daily, 0.1 cfs Aug. 13; minimum gage height, 2.09 ft Feb. 21, 22, 23, Mar. 1, 2.
Period of record: Maximum discharge, 813 cfs Apr. 18, 1965 (gage height, 8.42 ft); minimum, 0.1 cfs at times in 1961, 1963, 1964, 1968, 1970.

REMARKS.--Records good except those for winter months, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	.90	7.6	1.5	.90	.80	.60	2.6	101	70	1.5	.30	.30
2	.90	8.6	1.6	.90	.80	.60	2.4	96	60	1.3	.30	.30
3	.70	7.2	1.7	.90	.80	1.1	2.6	80	49	1.0	.20	.40
4	.70	6.9	1.1	.80	.80	1.3	2.8	67	39	.80	.20	.30
5	.70	6.6	1.0	.80	.70	1.2	3.8	57	28	.60	.20	.20
6	.80	6.0	1.1	.80	.70	1.2	7.6	49	22	.40	.20	.20
7	.90	5.7	1.2	.80	.70	1.2	31	42	17	.40	.20	.20
8	.80	5.4	1.3	.80	.70	1.2	151	36	13	.40	.30	.20
9	.70	4.8	1.3	.70	.70	1.2	180	31	9.7	.30	.20	.30
10	.70	4.6	1.5	.70	.70	1.1	183	28	7.2	.30	.20	.40
11	.70	4.3	1.5	.70	.80	1.1	148	25	6.0	.20	.20	.30
12	.70	4.0	1.5	.70	.80	1.0	132	22	5.0	.20	.20	.30
13	1.1	3.6	1.5	.60	.90	1.0	122	20	5.4	.20	.10	.20
14	1.3	3.3	1.5	.60	.90	1.0	116	19	5.0	.20	.20	.40
15	1.2	3.0	1.3	.60	.90	1.0	103	20	4.8	.20	.70	.50
16	1.2	2.6	1.3	.60	.80	.90	101	22	7.2	.20	.20	.90
17	1.5	2.3	1.3	.60	.80	.90	91	22	9.7	.20	.20	1.0
18	1.3	2.1	1.3	.60	.80	.90	84	18	8.2	.20	.20	1.2
19	1.2	1.9	1.3	.60	.70	.90	72	15	6.0	.60	.30	.90
20	1.3	1.8	1.3	.60	.70	.90	66	16	4.8	.50	.30	.90
21	1.5	1.8	1.3	.60	.70	1.2	81	115	3.3	.30	.20	1.0
22	1.3	1.7	1.5	.50	.60	1.3	99	178	2.8	.30	.30	.80
23	1.3	1.7	1.3	.50	.70	1.7	142	165	2.2	.30	.30	.60
24	1.3	1.8	1.3	.50	.70	2.1	246	150	1.8	.20	.30	.70
25	1.6	2.0	1.2	.60	.60	2.6	313	130	2.1	.20	.40	.90
26	2.3	1.8	1.2	.60	.60	3.8	263	105	3.8	.30	.30	.90
27	2.3	1.6	1.0	.60	.60	4.0	204	86	3.0	.60	.30	.90
28	2.1	1.5	1.0	.70	.60	4.8	163	76	2.4	.30	.20	.90
29	2.0	1.3	.90	.70	------	4.6	130	85	2.2	.50	.30	1.1
30	2.1	1.3	.90	.70	------	4.0	108	100	1.7	.80	.40	1.2
31	3.8	------	.90	.70	------	3.3	------	82	------	.70	.40	------
TOTAL	40.90	108.8	39.60	21.00	20.60	53.70	3,350.8	2,058	402.3	14.20	8.30	18.40
MEAN	1.32	3.63	1.28	.68	.74	1.73	112	66.4	13.4	.46	.27	.61
MAX	3.8	8.6	1.7	.90	.90	4.8	313	178	70	1.5	.70	1.2
MIN	.70	1.3	.90	.50	.60	.60	2.4	15	1.7	.20	.10	.20
CFSM	.05	.15	.05	.03	.03	.07	4.63	2.74	.55	.02	.01	.03
IN.	.06	.17	.06	.03	.03	.08	5.15	3.16	.62	.02	.01	.03

CAL YR 1969 TOTAL 6,431.70 MEAN 17.6 MAX 590 MIN .20 CFSM .73 IN 9.89
WTR YR 1970 TOTAL 6,136.60 MEAN 16.8 MAX 313 MIN .10 CFSM .69 IN 9.43

05336700 Kettle River below Sandstone, Minn.

LOCATION.--Lat 46°06'20", long 92°51'50", in NW¼SW¼ sec.22, T.42 N., R.20 W., Pine County, on left bank about 900 ft downstream from abandoned powerplant dam, on Sandstone Federal Correctional Institution property, 1.8 miles south of Sandstone.

PERIOD OF RECORD.--October 1967 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 930 ft (from topographic map).

EXTREMES.--Current year: Maximum discharge 5,510 cfs Apr. 25 (gage height, 8.84 ft); minimum daily, 84 cfs Aug. 31.
Period of record: Maximum discharge, 11,300 cfs Apr. 14, 1969 (gage height, 11,84 ft); minimum daily, 84 cfs Aug. 31, 1970.
Flood in April 1965 reached a stage of 12.96 ft, from floodmark (discharge, 13,400 cfs).

REMARKS.--Records good except those for winter months, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	168	228	168	136	131	127	228	3,030	1,500	232	154	86
2	185	259	168	135	131	127	220	2,740	1,360	224	142	90
3	185	287	157	133	132	142	220	2,450	1,210	212	130	88
4	185	292	142	133	132	148	208	2,120	1,050	196	125	88
5	185	292	157	133	133	151	220	1,830	893	189	120	88
6	185	302	157	133	134	168	250	1,600	763	175	112	86
7	182	326	157	132	135	157	413	1,390	653	168	110	86
8	182	292	157	132	136	154	2,130	1,230	573	161	122	86
9	175	277	157	132	138	168	4,030	1,090	495	157	130	88
10	175	273	157	132	142	169	3,830	981	453	161	127	94
11	164	264	157	131	142	164	3,240	893	407	161	115	94
12	164	255	157	131	139	161	2,880	830	368	154	110	94
13	175	250	157	131	145	154	2,510	770	358	151	105	94
14	175	220	157	130	146	154	2,210	725	363	151	102	96
15	175	216	156	130	144	157	1,980	695	337	142	120	105
16	175	224	155	130	140	161	1,900	695	353	136	120	105
17	175	224	154	129	138	157	1,840	681	401	130	112	105
18	175	224	157	129	136	154	1,690	653	502	125	107	105
19	175	192	157	129	132	154	1,660	599	465	122	107	102
20	175	189	150	128	135	154	1,780	573	407	120	102	102
21	178	212	148	128	132	154	2,090	1,610	358	120	100	102
22	178	200	147	128	120	161	2,560	2,980	311	120	100	102
23	178	196	142	128	112	171	3,060	2,680	282	122	96	102
24	175	192	140	128	112	185	4,230	2,380	259	122	94	102
25	175	192	140	128	128	196	5,240	2,520	241	122	94	102
26	175	182	140	129	130	212	5,340	2,880	259	125	96	107
27	175	145	139	129	125	228	4,730	2,100	273	148	94	107
28	175	175	139	129	123	224	4,200	1,640	277	151	88	115
29	175	175	139	130	------	232	3,740	1,400	268	148	86	127
30	178	168	138	130	------	241	3,330	1,510	250	171	86	127
31	200	------	137	130	------	228	------	1,580	------	164	84	------
TOTAL	5,497	6,923	4,683	4,046	3,723	5,313	71,959	48,855	15,689	4,780	3,390	2,975
MEAN	177	231	151	131	133	171	2,399	1,576	523	154	109	99.2
MAX	200	326	168	136	146	241	5,340	3,030	1,500	232	154	127
MIN	164	145	137	128	112	127	208	573	241	120	84	86

CAL YR 1969 TOTAL 244,370 MEAN 670 MAX 11,000 MIN 107
WTR YR 1970 TOTAL 177,833 MEAN 487 MAX 5,340 MIN 84

05338500 Snake River near Pine City, Minn.

LOCATION.--Lat 45°50'30", long 92°56'00", in SE¼NW¼ sec.26, T.39 N., R.21 W., Pine County, on left bank at site of former powerplant and dam, 0.5 mile downstream from Cross Lake and 1.5 miles northeast of Pine City.

DRAINAGE AREA.--958 sq mi.

RECORDS AVAILABLE.--June 1913 to September 1917, July 1951 to current year.

GAGE.--Water-stage recorder. Datum of gage is 919.00 ft above mean sea level datum of 1929. June 25, 1913, to Sept. 30, 1917, nonrecording gage at site 500 ft downstream at different datum. July 1 to Oct. 28, 1951, nonrecording gage at present site and datum.

AVERAGE DISCHARGE.--23 years, 568 cfs (8.05 inches per year).

EXTREMES.--Current year: Maximum discharge, 4,350 cfs Apr. 28 (gage height, 6.60 ft); minimum, 41 cfs Sept. 14 (gage height, 2.77 ft).
Period of record: Maximum discharge 11,500 cfs April 18, 1965 (gage height, 9.56 ft); minimum, 5.5 cfs Oct. 1, 1964 (gage height, 2.57 ft); result of dam rehabilitation 0.5 mile upstream.
A discharge measurement of 12,500 cfs was made May 9, 1950.

REMARKS.--Records good except those for winter periods, which are fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	108	190	134	125	91	117	180	3,670	976	273	148	44
2	110	184	129	124	91	118	180	3,270	1,020	248	134	51
3	88	184	120	122	91	126	185	2,910	1,040	230	112	69
4	101	178	120	120	91	128	190	2,560	996	178	101	61
5	125	167	144	120	91	126	207	2,200	887	158	97	55
6	118	162	162	118	92	124	255	1,870	780	144	89	55
7	127	162	162	116	92	122	400	1,600	658	144	85	71
8	106	162	153	112	92	120	867	1,350	544	125	93	57
9	83	158	148	110	92	120	1,500	1,130	438	112	101	59
10	113	153	148	105	92	120	1,890	956	393	108	101	81
11	75	158	153	104	92	120	2,060	790	348	97	97	67
12	75	148	153	102	92	120	2,130	714	313	93	89	57
13	115	148	153	100	92	120	2,150	604	400	153	81	46
14	117	139	148	98	92	120	2,130	553	430	162	81	44
15	101	116	153	97	92	120	2,010	544	462	167	112	69
16	134	112	151	96	92	120	1,910	502	695	153	93	74
17	129	134	148	94	95	120	1,690	430	848	144	69	78
18	125	158	151	92	97	125	1,500	423	936	120	64	81
19	112	125	148	91	97	135	1,530	385	897	139	78	74
20	134	120	144	91	97	140	1,720	348	799	139	66	78
21	116	125	145	91	100	136	1,950	355	723	129	55	108
22	116	129	142	91	106	132	2,250	378	604	108	61	93
23	101	129	141	91	112	134	2,720	510	502	97	51	66
24	112	129	137	91	115	136	3,070	685	430	97	51	85
25	108	139	139	91	116	140	3,430	829	348	93	51	101
26	129	139	135	91	117	150	3,760	819	334	85	46	108
27	116	139	131	91	117	160	4,030	809	306	120	53	89
28	97	139	130	91	117	170	4,140	838	292	116	47	74
29	97	134	129	91	------	175	4,110	867	306	144	44	74
30	101	134	128	91	------	180	3,940	858	292	162	51	66
31	139	------	127	91	------	180	------	907	------	167	47	------
TOTAL	3,428	4,394	4,406	3,138	2,753	4,154	58,084	34,664	17,997	4,405	2,448	2,115
MEAN	111	146	142	101	98.3	134	1,936	1,118	600	142	79.0	70.5
MAX	139	190	162	125	117	180	4,140	3,670	1,040	273	148	108
MIN	75	112	120	91	91	117	180	348	292	85	44	44
CFSM	.12	.15	.15	.11	.10	.14	2.02	1.17	.63	.15	.08	.07
IN.	.13	.17	.17	.12	.11	.16	2.25	1.35	.70	.17	.10	.08

CAL YR 1969 TOTAL 250,366 MEAN 686 MAX 10,100 MIN 55 CFSM .72 IN 9.72
WTR YR 1970 TOTAL 141,986 MEAN 389 MAX 4,140 MIN 44 CFSM .41 IN 5.51

05340000 Sunrise River near Lindstrom, Minn.

LOCATION.--Lat 45°27'00", long 92°53'10", in SW¼NE¼ sec.7, T.34 N., R.20 W., Chisago County, on left bank 20 ft downstream from highway bridge and 4.5 miles northwest of Lindstrom.

PERIOD OF RECORD.--July 1965 to current year. Records for January 1949 to July 1965 at site 6.5 miles upstream, published as "near Stacy", not equivalent owing to increased drainage area and Minnesota Game and Fish reservoir between sites.

GAGE.--Water-stage recorder. Altitude of gage is 850 ft (from topographic map).

AVERAGE DISCHARGE.--5 years, 80.4 cfs.

EXTREMES.--Current year: Maximum discharge, 304 cfs May 6 (gage height, 5.77 ft); minimum, 4.7 cfs Sept. 29 (gage height, 2.00 ft).
Period of record: Maximum discharge, 704 cfs Apr. 11, 1969 (gage height, 7.28 ft ; minimum 4.7 cfs Sept. 29, 1970 (gage height, 2.00 ft).

REMARKS.--Records good except those for winter period, which are fair. Some regulation by Minnesota Game and Fish Wildlife Refuge ponds above the station. At high stages a small part of flow discharges into the Rum River and Coon Creek basins from West Arm of Coon Lake and South Coon Lake, respectively.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6.8	18	24	27	28	20	32	120	104	46	33	36
2	6.8	17	24	27	27	20	35	122	98	52	31	36
3	6.8	17	24	27	26	20	38	120	92	42	30	34
4	6.8	19	23	27	25	20	41	121	87	38	28	36
5	6.5	28	22	27	24	20	45	209	83	34	27	28
6	6.8	28	21	27	24	20	52	289	80	34	25	22
7	6.3	28	21	27	24	20	60	264	74	32	26	19
8	6.5	30	22	27	24	20	79	211	70	30	32	13
9	6.5	26	22	27	24	20	92	166	68	27	31	12
10	6.3	26	22	27	24	20	92	131	68	23	28	8.5
11	6.5	26	23	27	23	20	90	109	67	22	28	13
12	6.1	26	24	27	22	20	89	102	65	22	26	16
13	9.0	26	25	27	21	19	88	127	76	26	25	8.2
14	8.8	28	26	27	20	19	86	152	96	46	23	6.3
15	8.2	24	26	27	20	19	86	142	108	51	34	10
16	11	24	26	27	20	18	88	109	128	46	32	9.3
17	9.6	24	26	27	20	18	88	91	135	47	28	11
18	9.0	23	27	27	20	18	82	89	116	46	26	11
19	9.6	23	28	27	20	18	88	117	105	65	24	11
20	11	23	27	27	20	18	102	95	95	67	22	6.8
21	11	24	27	27	20	19	103	113	87	61	21	6.5
22	10	25	27	27	20	19	98	138	81	56	20	6.1
23	10	26	27	27	20	19	101	120	70	52	19	5.4
24	11	24	27	27	20	20	97	108	60	47	18	7.0
25	11	23	27	27	20	20	96	108	56	44	17	8.5
26	12	22	27	27	20	20	97	107	60	40	16	9.3
27	12	22	27	27	20	20	97	101	57	44	14	5.8
28	11	23	27	28	20	21	98	99	54	42	24	5.2
29	12	24	27	29	------	23	100	100	50	39	45	4.9
30	12	24	27	30	------	26	104	104	48	38	54	5.1
31	18	------	27	29	------	30	------	105	------	36	50	------
TOTAL	284.9	721	780	845	616	624	2,444	4,089	2,438	1,295	857	410.9
MEAN	9.19	24.0	25.2	27.3	22.0	20.1	81.5	132	81.3	41.8	27.6	13.7
MAX	18	30	28	30	28	30	104	289	135	67	54	36
MIN	6.1	17	21	27	20	18	32	89	48	22	14	4.9
AC-FT	565	1,430	1,550	1,680	1,220	1,240	4,850	8,110	4,840	2,570	1,700	815

CAL YR 1969 TOTAL 30,054.9 MEAN 82.3 MAX 693 MIN 6.1 ACFT 59,610
WAT YR 1970 TOTAL 15,404.8 MEAN 42.2 MAX 289 MIN 4.9 ACFT 30,560

05340500 St. Croix River at St. Croix Falls, Wis.

LOCATION.--Lat 45°24'25", long 92°38'49", in NW 1/4 sec.30, T.34 N., R.18 W., Polk County, on left bank 1,800 ft downstream from powerplant of Northern States Power Co., in St. Croix Falls, and at mile 52.2.

DRAINAGE AREA.--5,930 sq mi, approximately.

PERIOD OF RECORD.--January 1902 to current year. Prior to January 1910, monthly discharge only, published in WSP 1308. Prior to October 1939, published as "near St. Croix Falls."

GAGE.--Water-stage recorder. Datum of gage is 690.47 ft above mean sea level, adjustment of 1912. Prior to July 1905, gage heights and discharge measurements were used by Loweth and Wolff, consulting engineers of St. Paul, Minn., to determine the flow. July 1905 to February 1940, records were computed from power generation at the St. Croix Falls powerplant.

AVERAGE DISCHARGE.--68 years, 4,090 cfs (9.37 inches per year).

EXTREMES.--Current year: Maximum discharge, 20,000 cfs Apr. 27 (gage height, 9.61 ft); minimum daily, 1,240 cfs Sept. 2.
Period of record: Maximum discharge, 54,900 cfs May 8, 1950 (gage height, 25.19 ft); minimum daily, 75 cfs July 17, 1910.

REMARKS.--Records good. Diurnal fluctuation caused by St. Croix Falls powerplant 1,800 ft upstream.

REVISIONS (WATER YEARS).--WSP 1115: 1929.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	2,610	2,680	2,790	2,250	2,220	2,040	3,190	15,100	7,330	2,360	1,680	1,250
2	2,010	3,340	2,730	2,410	2,170	1,790	3,090	13,900	7,660	1,960	1,650	1,240
3	1,640	3,490	2,770	2,050	2,020	1,980	3,040	13,100	7,390	2,110	1,570	1,330
4	2,310	3,800	2,280	2,300	2,140	2,370	3,010	12,300	7,050	1,970	1,600	1,360
5	1,980	3,160	2,250	2,040	2,050	1,640	3,230	11,000	6,560	1,710	1,610	1,360
6	2,630	3,230	1,830	2,230	1,950	2,360	3,620	9,990	4,970	2,440	1,540	1,500
7	1,960	3,180	1,590	1,690	2,030	2,220	4,540	8,740	4,960	1,580	1,530	1,520
8	2,160	2,920	2,490	2,220	1,740	2,410	6,680	7,750	4,470	1,580	1,520	1,480
9	2,250	2,860	2,040	2,280	2,030	2,720	11,900	7,350	3,720	1,790	1,650	1,410
10	2,430	2,950	2,110	1,800	1,610	2,390	13,200	6,660	3,790	2,200	1,890	1,490
11	2,410	2,960	2,380	1,960	1,580	2,420	15,700	5,960	3,080	1,540	1,520	1,320
12	2,380	2,770	2,160	2,340	1,570	2,500	15,800	5,770	3,500	1,910	1,480	1,450
13	2,550	2,470	2,370	2,050	2,030	2,280	14,000	5,530	3,200	1,880	1,590	1,380
14	2,240	2,410	1,830	2,080	1,790	2,200	11,900	4,850	2,860	3,000	1,520	1,440
15	2,630	2,110	2,780	2,090	1,990	2,080	10,900	4,760	4,160	1,970	1,490	1,470
16	2,640	2,100	2,180	2,320	2,280	2,320	9,860	4,560	3,670	2,760	1,520	1,550
17	2,330	3,520	1,920	1,940	1,920	2,030	9,230	4,580	4,860	1,680	1,540	1,830
18	2,870	2,220	2,310	2,070	2,050	2,430	8,660	4,580	4,980	1,760	1,560	1,790
19	2,290	2,380	2,090	2,450	1,950	1,950	8,970	4,570	4,710	1,830	1,560	1,600
20	2,980	1,340	2,310	2,230	2,050	2,360	10,400	4,320	4,540	1,770	1,560	1,790
21	2,140	1,850	2,210	2,680	1,880	2,180	11,500	3,890	4,240	1,940	1,530	1,630
22	3,470	1,810	2,220	1,800	1,690	2,230	12,300	5,090	3,350	1,780	1,450	1,650
23	2,320	1,880	2,150	2,160	2,300	2,590	15,500	7,210	3,080	1,760	1,370	1,630
24	2,030	2,810	2,300	1,750	1,830	2,560	17,100	8,580	3,090	1,920	1,390	1,780
25	2,260	2,910	2,140	1,910	2,070	3,220	18,500	8,490	2,800	1,710	1,290	1,640
26	2,580	3,230	2,220	2,210	2,050	3,130	18,900	8,550	2,870	1,560	1,290	1,560
27	2,560	2,110	2,080	1,970	1,910	3,070	19,400	8,860	2,830	1,630	1,290	1,780
28	2,840	2,350	2,320	1,720	1,990	3,110	19,000	7,950	2,270	1,960	1,280	1,990
29	2,380	1,790	2,270	2,180	------	3,100	18,000	7,130	2,840	1,630	1,260	1,710
30	2,670	1,990	2,080	2,140	------	3,430	16,100	6,990	2,640	2,980	1,300	1,690
31	2,220	------	2,220	2,140	------	3,200	------	6,610	------	1,530	1,330	------
TOTAL	74,770	78,620	69,420	65,460	54,890	76,310	337,220	234,720	127,470	60,200	46,360	46,620
MEAN	2,412	2,621	2,239	2,112	1,960	2,462	11,240	7,572	4,249	1,942	1,495	1,554
MAX	3,470	3,800	2,790	2,680	2,300	3,430	19,400	15,100	7,660	3,000	1,890	1,990
MIN	1,640	1,340	1,590	1,690	1,570	1,640	3,010	3,890	2,270	1,530	1,260	1,240
CFSM	.41	.44	.38	.36	.33	.42	1.90	1.28	.72	.33	.25	.26
IN.	.47	.49	.44	.41	.34	.48	2.12	1.47	.80	.38	.29	.29

CAL YR 1969	TOTAL	1,704,770	MEAN	4,671	MAX	40,500	MIN	1,340	CFSM	.79	IN	10.69
WTR YR 1970	TOTAL	1,272,060	MEAN	3,485	MAX	19,400	MIN	1,240	CFSM	.59	IN	7.98

05344500 Mississippi River at Prescott, Wis.

LOCATION.--Lat 44°44'45", long 92°48'00", in sec.9, T.26 N., R.20 W., Pierce County, on left bank at Prescott, 200 ft downstream from St. Croix River, 300 ft south of Chicago, Burlington & Quincy Railroad bridge, 800 ft south of bridge on U.S. Highway 10, and at mile 811.4 upstream from Ohio River.

DRAINAGE AREA.--44,800 sq mi, approximately.

PERIOD OF RECORD.--June 1928 to current year.

GAGE.--Water-stage recorder. Datum of gage is 600.00 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers). Prior to Aug. 2, 1932, nonrecording gage at railroad bridge 300 ft upstream at following datums: June 3, 1928, to Sept. 30, 1929, 69.27 ft higher; Oct. 1, 1929, to Sept. 30, 1930, 67.68 ft higher; Oct. 1, 1930, to Aug. 1, 1932, 69.28 ft higher. Aug. 2, 1932, to Oct. 30, 1938, water-stage recorder at present site at datum 69.28 ft higher. Auxiliary water-stage recorder 10.7 miles downstream from base gage.

AVERAGE DISCHARGE.--42 years, 15,600 cfs (4.73 inches per year).

EXTREMES.--Current year: Maximum discharge, 54,900 cfs Apr. 29 (gage height, 81.53 ft); minimum daily, 3,770 cfs Sept. 2; minimum gage height, 74.94 ft Sept. 27.
Period of record: Maximum discharge 228,000 cfs Apr. 18, 1965 (gage height, 93.11 ft); minimum daily, 1,380 cfs July 13, 1940; minimum gage height, 65.08 ft Aug. 29, 1934, present datum.

REMARKS.--Records good except for winter periods or periods of indefinite stage-discharge relation, which are fair. Some regulation by reservoirs, navigation dams, and powerplants at low and medium stages. Flood flow not materially affected by artificial storage.

REVISIONS (WATER YEARS).--WSP 1508: 1941.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	6,900	8,730	8,950	9,120	8,110	7,980	12,600	52,500	27,300	18,300	6,420	4,010
2	7,040	9,130	9,860	9,030	8,010	7,560	12,700	51,000	27,600	17,000	6,780	3,770
3	6,010	9,230	9,650	8,080	7,980	8,750	13,400	50,000	27,700	14,700	6,210	4,020
4	6,930	9,560	8,110	8,830	7,680	8,650	13,900	48,500	27,800	12,600	6,160	4,320
5	6,860	9,960	7,680	8,240	8,060	8,480	14,800	47,200	28,000	10,400	6,090	4,300
6	6,770	9,980	7,960	7,840	7,930	8,340	15,400	44,500	27,400	9,560	5,740	4,620
7	6,430	9,580	7,680	7,190	8,010	8,530	16,400	42,100	25,400	9,940	6,090	4,840
8	6,470	9,560	7,900	7,880	7,820	8,620	17,500	39,900	23,800	10,600	5,960	4,830
9	7,550	9,850	7,720	7,850	8,030	8,700	22,500	38,400	22,000	10,300	6,210	4,790
10	7,590	10,000	7,460	8,260	8,520	8,380	28,200	36,500	19,900	10,000	5,840	4,650
11	8,400	9,770	6,960	8,210	8,010	8,720	32,300	34,300	19,700	10,400	5,320	4,500
12	8,440	9,710	7,670	8,270	8,520	9,350	35,200	32,600	19,000	9,780	5,770	4,630
13	8,090	8,250	7,880	8,110	7,860	8,940	37,800	30,700	18,800	9,730	5,620	4,050
14	9,700	8,400	8,320	8,040	7,440	8,630	38,900	31,000	18,800	9,900	6,360	4,540
15	9,350	8,970	8,060	8,100	7,890	8,660	38,200	29,400	17,800	9,850	5,820	4,610
16	9,140	10,400	7,070	8,420	8,340	9,270	36,900	28,100	18,100	9,330	5,470	4,530
17	8,950	9,010	6,490	8,110	7,550	9,400	37,100	27,600	19,800	9,430	5,140	4,820
18	8,870	7,870	8,230	7,960	7,780	10,400	33,700	27,500	21,900	9,860	5,250	5,250
19	8,810	8,380	7,960	8,260	7,890	9,370	32,900	28,000	22,400	10,300	5,310	4,240
20	9,160	6,180	8,170	7,870	7,720	9,350	34,100	27,800	23,500	9,530	4,850	5,060
21	8,630	6,350	7,250	8,390	7,270	9,540	34,500	27,300	24,800	9,310	4,600	5,030
22	9,550	6,840	8,140	7,710	7,160	9,720	36,500	26,100	25,200	8,110	4,760	4,840
23	8,330	7,110	7,950	8,060	7,720	9,900	38,400	25,700	24,400	8,060	4,060	5,440
24	8,200	8,080	8,380	7,690	7,630	10,000	40,700	25,600	24,000	8,420	4,370	5,160
25	8,740	8,610	7,750	7,680	8,010	11,200	42,900	25,600	23,000	7,550	3,980	5,160
26	8,900	10,000	7,330	8,110	7,680	11,200	45,900	24,400	22,400	7,510	3,920	4,670
27	8,780	8,330	8,020	7,780	7,720	11,400	48,300	24,200	21,800	7,980	3,990	4,920
28	8,800	7,950	8,230	7,700	7,530	11,500	51,200	25,600	20,700	8,230	3,850	4,900
29	8,910	7,640	8,290	8,040	------	11,800	52,800	26,600	20,100	7,630	4,500	5,370
30	8,410	7,780	8,130	8,080	------	12,000	52,800	26,700	18,700	8,740	4,380	5,210
31	8,900	------	8,580	8,180	------	11,900	------	26,700	------	6,880	4,310	------
TOTAL	253,610	261,210	247,830	251,090	219,870	296,240	968,500	1,032.1M	681,800	309,930	163,130	141,080
MEAN	8,181	8,707	7,995	8,100	7,853	9,556	32,280	33,290	22,730	9,998	5,262	4,703
MAX	9,700	10,400	9,860	9,120	8,520	12,000	52,800	52,500	28,000	18,300	6,780	5,440
MIN	6,010	6,180	6,490	7,190	7,160	7,560	12,600	24,200	17,800	6,880	3,850	3,770
CFSM	.18	.19	.18	.18	.18	.21	.72	.74	.51	.22	.12	.11
IN.	.21	.22	.21	.21	.18	.25	.80	.86	.57	.26	.14	.12

CAL YR 1969 TOTAL 8,653,150 MEAN 23,710 MAX 197,000 MIN 3,920 CFSM .53 IN 7.19
WTR YR 1970 TOTAL 4,826,390 MEAN 13,220 MAX 52,800 MIN 3,770 CFSM .30 IN 4.01

M Expressed in thousands.

NOTE.--Indefinite stage-discharge relation ~~Oct. 1-5~~, 16-28, ~~Nov. 19 to Dec. 7~~, July 29 to Sept. 30.

05353800 Straight River near Faribault, Minn.

LOCATION.--Lat 44°15'29", long 93°13'51", in W½SE¼ sec.9, T.109 N., R.20 W., Rice County, on right bank 15 ft downstream from highway bridge, 2.8 miles upstream from Falls Creek and 3.2 miles southeast of Faribault.
DRAINAGE AREA.--442 sq mi (including [illegible] sq mi [illegible])
PERIOD OF RECORD.--October 1965 to current year.

GAGE.--Water-stage recorder. Altitude of gage is 1,035 ft (from topographic map).

AVERAGE DISCHARGE.--5 years, 220 cfs (6.74 inches per year)

EXTREMES.--Current year: Maximum discharge, 1,070 cfs Apr. 8 (gage height, 6.32 ft); minimum, 22 cfs Nov. 28 (gage height, 3.80 ft).
Period of record: Maximum discharge, 3,970 cfs Mar. 25, 1969 (gage height 9.86 ft); minimum daily, 11 cfs Feb. 18 to Mar. 1, 1968

REMARKS.--Records good except for winter period, which are fair. Records of water temperatures and suspended sediment loads for the water year 1970 are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	40	70	38	25	48	38	263	361	844	94	525	41
2	41	99	38	25	48	38	294	377	645	89	340	43
3	42	78	36	25	45	38	313	349	483	81	212	44
4	43	71	32	26	42	38	309	309	380	70	160	46
5	44	48	31	28	41	38	426	277	312	63	131	40
6	45	58	30	29	41	38	663	249	262	59	110	46
7	46	58	30	31	41	38	868	230	226	61	99	44
8	45	54	29	33	41	38	989	216	200	57	102	38
9	45	53	29	33	41	38	753	209	178	54	95	39
10	44	50	28	35	41	38	539	210	165	52	88	61
11	43	50	28	37	40	38	419	203	159	50	83	48
12	42	49	28	39	39	38	351	198	156	50	77	44
13	42	46	28	41	38	38	340	194	182	50	71	42
14	43	38	27	43	38	38	396	717	164	93	66	40
15	44	37	26	45	38	38	446	925	203	76	62	55
16	54	39	25	47	38	38	451	726	298	61	56	59
17	50	40	25	48	38	38	421	556	319	56	52	69
18	40	46	25	48	38	38	366	450	270	53	52	65
19	44	37	25	48	38	38	402	372	210	68	51	61
20	57	38	25	48	38	39	841	316	194	82	49	55
21	48	43	25	48	38	40	923	274	188	78	46	89
22	36	39	25	48	38	40	833	245	170	62	46	80
23	27	39	25	48	38	40	823	233	157	54	43	65
24	40	40	25	48	38	40	749	223	143	50	41	65
25	40	42	25	48	38	40	633	249	130	47	42	102
26	40	40	25	48	38	40	527	234	138	45	41	173
27	40	37	25	48	38	40	453	296	137	79	40	140
28	40	35	25	48	38	43	397	504	129	114	39	115
29	40	37	25	48	------	70	353	570	115	252	44	96
30	41	39	25	48	------	140	332	871	103	786	39	83
31	67	------	25	48	------	224	------	988	------	720	38	------
TOTAL	1,353	1,450	858	1,262	1,116	1,518	15,873	12,131	7,260	3,606	2,940	1,988
MEAN	43.6	48.3	27.7	40.7	39.9	49.0	529	391	242	116	94.8	66.3
MAX	67	99	38	48	48	224	989	988	844	786	525	173
MIN	27	35	25	25	38	38	263	194	103	45	38	38

CAL YR 1969 TOTAL 106,852 MEAN 293 MAX 3,810 MIN 25
WTR YR 1970 TOTAL 51,355 MEAN 141 MAX 989 MIN 25

PEAK DISCHARGE (BASE, 1,500 CFS).--No peak above base.

05355200 Cannon River at Welch, Minn.

LOCATION.--Lat 44°33'50", long 92°43'55", in NW¼SW¼ sec.27, T.113 N., R.16 W., Goodhue County, on right bank 0.3 mile downstream from highway bridge at Welch and 1.8 miles upstream from Belle Creek.

DRAINAGE AREA.--1,320 sq mi, approximately.

PERIOD OF RECORD.--June 1909 to January 1914 (no winter records 1909-11), November 1930 to current year.

GAGE.--Water-stage recorder. Datum of gage is 699.16 ft above mean sea level, datum of 1929. Prior to Nov. 11, 1930, nonrecording gage on highway bridge at site 0.3 mile upstream at datum 3.00 ft lower. Nov. 11, 1930, to Oct. 11, 1938, water-stage recorder at site 0.3 mile upstream at present datum.

AVERAGE DISCHARGE.--41 years (1911-13, 1931-70), 490 cfs (5.04 inches per year).

EXTREMES.--Current year: Maximum discharge, 6,480 cfs May 28 (gage height, 9.92 ft); minimum daily, 137 cfs many days; minimum gage height, 1.56 ft Dec. 23.
Period of record: Maximum discharge, 36,100 cfs Apr. 8, 1965 (gage height, 14.01 ft); minimum, 2.5 cfs Jan. 3, 1950 (gage height, 0.06 ft, backwater from ice).
Maximum stage known, 17.1 ft, present datum, in April 1888, from floodmark at mill about 2,400 ft upstream.

REMARKS.--Records good except those for winter periods, which are fair. Diurnal fluctuation caused by powerplants above station to Dec. 31, 1966 when the powerplants were shut down.

REVISIONS (WATER YEARS).--WSP 1308: 1912(M). WSP 1508: 1933. WSP 1914: 1960.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	170	305	212	139	137	190	448	1,110	2,020	377	843	200
2	185	298	212	139	137	188	489	1,110	1,780	389	733	194
3	194	292	206	139	137	194	528	1,100	1,530	385	575	200
4	203	295	185	139	137	210	539	1,030	1,310	321	424	191
5	209	282	182	139	137	230	574	964	1,120	305	361	182
6	222	276	190	139	139	250	713	894	978	295	318	225
7	212	257	196	138	138	260	1,030	852	865	289	292	244
8	212	253	190	137	148	260	1,540	811	810	282	295	203
9	191	250	180	137	160	260	1,570	792	705	269	282	176
10	200	237	175	137	168	260	1,320	709	683	263	266	222
11	182	234	175	137	172	260	1,090	615	645	260	253	185
12	185	230	177	137	175	260	909	621	661	253	247	179
13	212	225	180	137	175	258	863	602	1,350	257	247	167
14	222	219	180	137	175	255	816	756	1,280	266	234	162
15	216	209	175	137	180	252	854	1,240	1,170	292	234	188
16	257	209	170	137	195	260	977	1,440	1,380	273	222	197
17	432	222	168	137	205	268	934	1,290	1,360	260	197	222
18	799	253	165	137	209	275	935	1,150	1,190	250	194	241
19	475	210	162	137	209	290	940	1,000	996	289	209	234
20	343	210	160	137	209	315	1,310	882	930	266	200	225
21	282	210	156	137	209	335	1,730	819	870	257	188	234
22	257	210	153	137	209	335	1,820	744	799	253	191	216
23	285	210	150	137	209	380	1,910	688	733	241	182	212
24	302	210	148	137	209	380	1,790	671	678	234	176	234
25	234	210	145	137	209	408	1,670	711	620	231	170	263
26	231	206	145	137	208	453	1,520	685	266	219	170	335
27	209	200	143	137	206	506	1,380	766	222	225	173	361
28	185	195	142	137	200	517	1,260	4,270	225	257	165	332
29	200	191	140	137	------	507	1,150	2,120	234	328	292	312
30	225	200	139	137	------	480	1,090	2,220	315	446	257	279
31	285	------	139	137	------	455	------	2,080	------	749	231	------
TOTAL	8,016	7,008	5,240	4,260	5,001	9,751	33,699	34,742	27,725	9,281	8,821	6,815
MEAN	259	234	169	137	179	315	1,123	1,121	924	299	285	227
MAX	799	305	212	139	209	517	1,910	4,270	2,020	749	843	361
MIN	170	191	139	137	137	188	448	602	222	219	165	162
CFSM	.20	.18	.13	.10	.14	.24	.85	.85	.70	.23	.22	.17
IN.	.23	.20	.15	.12	.14	.27	.95	.98	.78	.26	.25	.19

CAL YR 1969 TOTAL 300,337 MEAN 823 MAX 9,070 MIN 139 CFSM .62 IN 8.46
WTR YR 1970 TOTAL 160,359 MEAN 439 MAX 4,270 MIN 137 CFSM .33 IN 4.52

05373000 South Fork Zumbro River near Rochester, Minn.

LOCATION.--Lat 44°04'00", long 92°27'55", in SE¼ sec.14, T.107 N., R.14 W., Olmsted County, on left bank 30 ft upstream from ford, ~~a quarter of a~~ mile downstream from sewage plant, 1.6 miles north of Rochester, 2 miles downstream from Cascade Creek, and 2.5 miles downstream from Silver Lake Dam.

DRAINAGE AREA.--304 sq mi.

PERIOD OF RECORD.--January 1952 to current year.

GAGE.--Water-stage recorder. Datum of gage is 949.56 ft above mean sea level, datum of 1929.

AVERAGE DISCHARGE.--18 years, 121 cfs (5.41 inches per year).

EXTREMES.--Current year: Maximum discharge, 2,810 cfs May 28 (gage height, 9.77 ft); minimum, 21 cfs Dec. 20 (gage height, 1.93 ft); minimum gage, 1.42 ft Aug. 27.
Period of record: Maximum discharge, 19,600 cfs Mar. 1, 1965 (gage height, 19.12 ft, from floodmark); minimum, 8.4 cfs Dec. 7, 1955.
Flood of July 21, 1951 reached a stage of about 17.5 ft, from information by sewage plant superintendent. This is the highest known stage outside the period of record since at least 1908.

REMARKS.--Records good. Slight regulation at times from Silver Lake and at very low flows from sewage-plant effluent.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	52	75	54	48	50	49	192	181	572	146	106	67
2	62	78	53	49	47	52	202	179	402	139	95	65
3	61	77	53	48	47	202	218	166	331	129	91	68
4	55	74	49	48	48	98	212	154	287	122	87	64
5	54	72	53	47	43	106	265	140	252	117	85	62
6	57	70	53	44	42	131	336	133	220	117	83	99
7	52	69	55	43	43	131	340	124	197	115	82	69
8	50	66	53	41	43	114	363	118	178	112	80	64
9	50	64	49	38	45	119	264	147	177	109	79	69
10	49	65	48	36	46	121	168	129	154	109	79	72
11	47	65	47	35	45	113	135	122	161	105	78	66
12	59	64	47	38	43	115	120	133	234	101	79	63
13	80	63	51	38	44	107	139	177	402	103	77	62
14	72	57	50	38	42	106	178	343	228	119	75	65
15	72	55	47	39	41	99	210	491	391	104	74	77
16	79	56	47	42	44	97	192	344	402	98	71	70
17	75	65	75	41	45	100	171	255	520	96	72	74
18	72	67	47	40	46	110	132	216	1,500	94	72	70
19	71	59	71	42	43	146	157	186	537	189	72	67
20	70	58	27	42	44	177	594	165	419	119	69	66
21	68	59	43	41	48	157	663	152	484	101	68	77
22	66	54	45	39	56	164	450	248	372	95	67	73
23	64	51	44	40	65	225	585	321	285	91	65	67
24	64	51	44	41	65	212	461	294	245	90	67	71
25	62	56	42	41	51	266	365	1,210	216	89	65	72
26	61	55	44	43	47	308	307	1,090	211	86	65	61
27	61	53	44	45	46	278	248	520	187	136	54	58
28	61	51	46	46	46	208	210	1,780	172	123	62	57
29	60	51	47	46	------	201	191	1,090	159	161	66	52
30	62	54	48	46	------	183	169	586	150	207	62	46
31	76	------	49	48	------	166	------	523	------	145	62	------
TOTAL	1,944	1,854	1,525	1,313	1,315	4,661	8,237	11,717	10,045	3,667	2,309	2,013
MEAN	62.7	61.8	49.2	42.4	47.0	150	275	378	335	118	74.5	67.1
MAX	80	78	75	49	65	308	663	1,780	1,500	207	106	99
MIN	47	51	27	35	41	49	120	118	150	86	54	46
CFSM	.21	.20	.16	.14	.15	.49	.90	1.24	1.10	.39	.25	.22
IN.	.24	.23	.19	.16	.16	.57	1.01	1.43	1.23	.45	.28	.25

CAL YR 1969 TOTAL 60,575 MEAN 166 MAX 4,160 MIN 27 CFSM .55 IN 7.41
WTR YR 1970 TOTAL 50,600 MEAN 139 MAX 1,780 MIN 27 CFSM .46 IN 6.19

PEAK DISCHARGE (Base, 1,000 CFS).--May 25 (1945) 2,370 cfs (9.22 ft); May 28 (1830) 2,810 cfs (9.77 ft); June 18 (1100) 2,270 cfs (7.25 ft).

05374000 Zumbro River at Zumbro Falls, Minn.

LOCATION.--Lat 44°17'12", long 92°25'56", in sec.36, T.110 N., R.14 W., Wabasha County on left bank in Zumbro Falls, 1,000 ft downstream from Cold Creek, 0.7 mile upstream from bridge on U.S. Highway 63, and 6.3 miles downstream from North Fork.

DRAINAGE AREA.--1,130 sq mi, approximately.

PERIOD OF RECORD.--June 1909 to September 1917, April to November 1929, March 1930 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 811.26 ft above mean sea level, datum of 1929. Prior to Nov. 11, 1933, nonrecording gage on bridge 800 ft downstream at same datum.

AVERAGE DISCHARGE.--48 years (1909-17, 1930-70), 481 cfs (5.78 inches per year).

EXTREMES.--Current year: Maximum discharge, 13,800 cfs May 28 (gage height, 21.38 ft); minimum, 61 cfs Feb. 25 (gage height, 6.20 ft).

Period of record: Maximum discharge, 35,900 cfs July 22, 1951 (gage height, 30.80 ft, from floodmark); minimum, 27 cfs Jan. 12, 1935; minimum gage height, 5.96 ft Nov. 27, 1967.

Flood of April 1888 reached stage of about 30.5 ft at present site or 29.7 ft original site. Flood in 1859 is known to have exceeded that of 1888 (gage height, not determined).

REMARKS.--Records good except those for winter periods, which are fair. Diurnal fluctuation caused by power-plant above station. Records of chemical analyses for the water year 1970 are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 355: 1912. WSP 895: Drainage area. WSP 1508: 1911, 1917, 1930-31(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	251	291	232	207	149	274	600	877	2,410	403	575	168
2	286	295	320	201	120	384	713	708	1,770	406	452	297
3	281	304	478	292	211	560	801	442	1,500	382	422	258
4	270	301	254	168	167	560	800	625	1,280	357	414	244
5	262	298	348	190	183	512	539	844	1,060	342	414	242
6	257	291	342	300	272	346	729	502	1,040	339	318	370
7	241	279	223	550	273	440	1,160	321	756	323	224	284
8	228	272	257	601	192	195	1,460	504	715	310	303	233
9	242	266	299	505	207	220	1,720	608	907	307	279	199
10	212	263	257	422	121	427	1,440	606	541	301	231	269
11	211	258	237	100	179	468	1,110	369	589	293	278	229
12	215	258	238	150	155	505	946	328	519	288	272	176
13	267	251	215	210	147	307	908	393	1,190	302	243	120
14	284	244	133	213	125	208	907	702	1,230	317	140	211
15	287	238	117	270	92	208	934	1,010	1,040	318	297	250
16	296	241	224	227	128	242	940	1,110	1,380	290	192	278
17	290	244	230	170	280	349	924	1,080	1,080	277	209	270
18	286	269	309	133	245	497	889	941	1,050	269	254	281
19	282	262	271	120	189	382	891	886	1,300	314	268	228
20	278	239	290	232	133	498	1,220	716	969	349	249	128
21	270	251	190	240	205	492	2,000	585	870	323	228	395
22	253	249	198	240	161	447	1,820	531	906	295	173	258
23	250	250	195	240	195	511	1,750	826	870	273	159	223
24	243	397	229	226	210	493	1,770	566	565	263	167	274
25	238	262	128	130	171	500	1,460	698	550	255	214	388
26	234	252	120	128	165	516	1,200	1,370	490	246	267	323
27	230	243	159	246	153	501	1,030	1,310	515	287	198	216
28	231	238	84	348	156	250	934	6,410	503	331	159	389
29	230	226	94	291	------	363	895	2,910	444	428	389	304
30	229	233	161	234	------	547	874	3,520	430	618	225	279
31	269	------	246	232	------	544	------	3,640	------	623	214	------
TOTAL	7,903	7,965	7,078	7,816	4,984	12,746	33,364	35,938	28,469	10,429	8,427	7,784
MEAN	255	266	228	252	178	411	1,112	1,159	949	336	272	259
MAX	296	397	478	601	280	560	2,000	6,410	2,410	623	575	395
MIN	211	226	84	100	92	195	539	321	430	246	140	120
CFSM	.23	.23	.20	.22	.16	.36	.98	1.03	.84	.30	.24	.23
IN.	.26	.26	.23	.26	.16	.42	1.10	1.18	.94	.34	.28	.26

CAL YR 1969 TOTAL 240,331 MEAN 658 MAX 11,600 MIN 84 CFSM .58 IN 7.91
WTR YR 1970 TOTAL 172,903 MEAN 474 MAX 6,410 MIN 84 CFSM .42 IN 5.69

05376000 North Fork Whitewater River near Elba, Minn.

(Hydrologic bench-mark station)

LOCATION.--Lat 44°05'30", long 92°03'57", in sec.7, T.107 N., R.10 W., Winona County, on left bank 2.3 mile upstream from Middle Fork, 2.4 miles west of Elba, and 3.5 miles upstream from confluence with South Fork.

DRAINAGE AREA.--101 sq mi.

PERIOD OF RECORD.--May 1939 to September 1941, July 1967 to current year.

GAGE.--Water-stage recorder. Datum of gage is 769.60 ft above mean sea level, datum of 1929. Oct. 12, 1939, to Sept. 30, 1941, graphic water-stage recorder at site 600 ft downstream at same datum. Prior to Oct. 12, 1939, nonrecording gage at site 2 miles downstream at different datum.

AVERAGE DISCHARGE.--5 years (1939-41, 1967-70), 25.6 cfs (3.44 inches per year).

EXTREMES.--Current year: Maximum discharge, 502 cfs June 13 (gage height, 5.32 ft); minimum, 13 cfs Feb. 2 (2.32 ft).

Period of record: Maximum discharge, 2,730 cfs July 11, 1940 (gage height, 6.13 ft), may have been exceeded Sept. 15, 1941; minimum, 11 cfs Feb. 21, 1968.

Flood of June 15, 1967 reached a stage of 8.56 ft from highwater mark in well (discharge, 2,850 cfs).

REMARKS.--Records good. Records of chemical analyses and suspended sediment loads for the current year are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	22	22	19	19	19	19	23	26	52	29	31	18
2	21	22	19	18	18	19	25	26	45	29	24	18
3	20	21	19	18	19	29	25	25	39	29	23	18
4	20	21	19	19	19	34	25	25	37	28	22	18
5	19	21	19	18	19	26	26	24	35	27	21	18
6	20	21	19	18	19	27	37	23	34	26	21	24
7	19	20	20	18	19	25	48	23	33	26	21	35
8	19	20	20	18	19	24	61	23	31	25	21	21
9	19	20	19	18	19	23	46	25	30	25	21	20
10	19	20	19	18	19	22	37	24	30	25	20	22
11	19	20	19	19	19	21	34	24	30	25	20	21
12	20	20	19	19	19	21	31	24	32	24	22	20
13	24	19	19	18	18	21	31	25	115	24	20	19
14	25	19	19	19	18	21	33	31	107	25	19	18
15	24	19	19	19	19	20	33	39	127	25	20	22
16	24	19	19	19	18	20	31	34	127	24	19	21
17	21	20	19	19	19	20	29	30	92	23	18	22
18	21	21	19	19	19	21	28	29	155	23	18	20
19	21	20	19	19	18	21	29	27	63	26	19	20
20	21	20	19	18	18	22	32	26	50	26	18	19
21	21	19	19	19	18	22	34	25	52	23	18	23
22	20	19	19	19	19	23	32	27	45	23	18	21
23	20	19	19	17	19	24	32	47	40	22	18	22
24	20	19	19	19	19	24	31	35	38	21	18	22
25	20	19	19	19	19	25	30	38	36	21	17	22
26	20	19	19	18	19	25	29	42	37	21	17	22
27	20	19	19	18	19	25	28	44	36	25	17	21
28	20	19	19	19	18	25	27	98	34	24	16	21
29	19	19	19	19	------	25	26	59	32	49	29	21
30	20	19	19	19	------	24	26	47	31	44	21	20
31	22	------	19	19	------	23	------	45	------	37	19	------
TOTAL	640	595	591	575	524	721	959	1,040	1,645	824	626	629
MEAN	20.6	19.8	19.1	18.5	18.7	23.3	32.0	33.5	54.8	26.6	20.2	21.0
MAX	25	22	20	19	19	34	61	98	155	49	31	35
MIN	19	19	19	17	18	19	23	23	30	21	16	18
CFSM	.20	.20	.19	.18	.19	.23	.32	.33	.54	.26	.20	.21
IN.	.24	.22	.22	.21	.19	.27	.35	.38	.61	.30	.23	.23

CAL YR 1969 TOTAL 11,577 MEAN 31.7 MAX 1,020 MIN 14 CFSM .31 IN 4.26
WTR YR 1970 TOTAL 9,369 MEAN 25.7 MAX 155 MIN 16 CFSM .25 IN 3.45

05376500 South Fork Whitewater River near Altura, Minn.

LOCATION.--Lat 44°04'10", long 91°58'49", in SE¼ sec.14, T.107 N., R.10 W., Winona County, on left bank 500 ft upstream from highway bridge, 1.4 miles upstream from small tributary entering from the west, 2 miles west of Altura, and 2.4 miles upstream from Keefer Creek.

DRAINAGE AREA.--76.8 sq mi.

PERIOD OF RECORD.--October 1939 to current year.

GAGE.--Water-stage recorder. Datum of gage is 761.80 ft above mean sea level, adjustment of 1912 (levels by Corps of Engineers).

AVERAGE DISCHARGE.--31 years, 27.2 cfs (4.81 inches per year).

EXTREMES.--Current year: Maximum discharge, 1,920 cfs June 13 (gage height, 6.95 ft); minimum daily, 11 cfs Dec. 24 to Jan. 27; minimum gage height, 1.38 ft July 16, 17.
Period of record: Maximum discharge, 5,460 cfs Aug. 31, 1947 (gage height, 10.61 ft); minimum, 3.8 cfs Mar. 24, 1940; minimum gage height, 0.23 ft Mar. 12, 1965.

REMARKS.--Records fair.

REVISIONS (WATER YEARS).--WSP 1278: 1940(M), 1942(M), 1945(M), 1947(M), 1949(M), 1950(P). WSP 1508: 1950(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	20	18	14	11	12	15	25	27	107	32	27	23
2	20	18	15	11	12	15	26	29	74	30	20	24
3	19	17	14	11	12	15	27	33	64	30	22	24
4	20	16	14	11	12	30	25	39	57	28	21	24
5	20	16	14	11	12	24	28	35	54	28	19	24
6	22	16	14	11	13	21	33	34	48	28	19	29
7	21	15	14	11	13	19	35	33	45	27	18	24
8	21	15	14	11	13	18	38	33	42	26	17	21
9	20	15	14	11	13	18	34	32	39	25	17	24
10	19	15	14	11	13	17	31	35	37	24	16	21
11	19	15	14	11	13	17	28	33	35	24	16	16
12	21	14	14	11	13	17	27	34	40	23	16	16
13	28	14	14	11	13	17	31	38	239	22	17	15
14	28	14	14	11	13	17	35	49	98	24	17	15
15	21	14	14	11	13	17	38	66	110	23	18	17
16	21	14	14	11	13	17	35	54	96	21	17	17
17	20	14	13	11	13	17	33	49	86	21	17	15
18	19	14	13	11	14	18	31	46	143	28	18	14
19	18	14	12	11	14	21	33	45	70	35	18	14
20	17	14	12	11	14	24	41	43	56	35	18	14
21	17	14	12	11	14	23	41	37	66	31	18	14
22	16	14	12	11	14	24	38	49	50	28	18	14
23	15	14	12	11	15	27	42	75	45	28	18	14
24	15	14	11	11	15	31	37	62	42	28	18	17
25	15	14	11	11	15	35	35	65	41	28	17	19
26	15	14	11	11	15	36	33	69	38	28	17	19
27	15	14	11	11	15	32	31	64	35	42	17	18
28	15	14	11	12	15	29	29	136	34	37	18	18
29	15	14	11	12	------	26	28	100	34	54	24	18
30	16	15	11	13	------	28	26	78	33	46	22	18
31	17	------	11	13	------	25	------	81	------	32	21	------
TOTAL	585	443	399	347	376	690	974	1,603	1,958	916	576	560
MEAN	18.9	14.8	12.9	11.2	13.4	22.3	32.5	51.7	65.3	29.5	18.6	18.7
MAX	28	18	15	13	15	36	42	136	239	54	27	29
MIN	15	14	11	11	12	15	25	27	33	21	16	14
CFSM	.25	.19	.17	.15	.17	.29	.42	.67	.85	.38	.24	.24
IN.	.28	.21	.19	.17	.18	.33	.47	.78	.95	.44	.28	.27

CAL YR 1969 TOTAL 10,256 MEAN 28.1 MAX 716 MIN 10 CFSM .37 IN 4.97
WTR YR 1970 TOTAL 9,427 MEAN 25.8 MAX 239 MIN 11 CFSM .34 IN 4.57

PEAK DISCHARGE (BASE, 400 CFS).--June 13 (2200) 1,920 cfs (6.95 ft); June 15 (1215) 411 cfs (3.60 ft).

05378500 Mississippi River at Winona, Minn.

LOCATION.--Lat 44°03'20", long 91°38'15", in sec.23, T.107 N., R.7 W., Winona County, on right bank at Winona pumping station in Winona, 9.5 miles upstream from Trempealeau River and at mile 725.7 upstream from the Ohio River.

DRAINAGE AREA.--59,200 sq mi, approximately.

PERIOD OF RECORD.--June 1928 to current year. Gage-height records collected in this vicinity since 1878 are contained in reports of Mississippi River Commission.

GAGE.--Water-stage recorder. Datum of gage is 639.~~4~~6 ft above mean sea level, datum of 1929. June 10, 1928, to Apr. 15, 1931, nonrecording gage at site 800 ft upstream. Prior to Oct. 1, 1929, at datum 0.20 ft higher and Oct. 1, 1929, to Apr. 15, 1931, at datum 0.12 ft lower. Apr. 16, 1931, to Nov. 12, 1934, nonrecording gage at present site and datum. Since Mar. 31, 1937, auxiliary water-stage recorder 2.7 miles upstream at tailwater of navigation dam 5A.

AVERAGE DISCHARGE.--42 years, 25,260 cfs (5.79 inches per year).

EXTREMES.--Current year: Maximum discharge, 64,400 cfs May 3 (gage height, 8.88 ft); minimum daily, 6,700 cfs Sept. 4.

Period of record: Maximum discharge, 268,000 cfs Apr. 19, 1965 (gage height, 20.77 ft, from floodmark); minimum, 2,250 cfs Dec. 29, 1933 (gage height, -1.18 ft); minimum gage height, -3.38 ft Aug. 31, 1934.

REMARKS.--Records good. Records of chemical analyses for the current year are published in Part 2 of this report. Some regulation by reservoirs, navigation dams, and powerplants at low and medium stages. Flood flow not materially affected by artificial storage.

COOPERATION.--Gage-height record at dam 5A furnished by Corps of Engineers.

REVISIONS (WATER YEARS).--WSP 700: Drainage area.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10,800	17,500	16,600	14,400	13,900	13,900	22,900	62,600	54,200	25,500	14,800	7,600
2	12,400	18,800	15,600	14,500	13,800	14,100	22,400	63,500	52,900	25,600	14,800	7,400
3	15,200	17,600	15,800	14,500	13,500	18,400	23,100	63,600	52,600	25,200	14,300	7,200
4	14,800	15,200	15,800	14,500	11,100	18,600	22,500	63,600	54,600	23,000	12,900	6,700
5	13,200	16,200	16,100	14,500	11,700	17,300	22,300	63,100	56,700	19,000	11,800	7,400
6	12,700	16,100	16,100	14,200	13,500	17,500	21,500	62,000	57,000	16,600	11,300	9,000
7	13,000	16,300	16,300	14,000	14,100	17,500	23,500	59,900	55,800	14,300	10,500	9,700
8	12,000	16,800	18,500	13,700	14,200	18,500	26,800	58,100	50,600	12,000	10,800	12,600
9	11,900	16,900	18,500	12,000	15,000	15,700	34,600	57,400	47,100	12,100	11,100	13,500
10	12,100	17,100	10,800	12,000	15,100	15,200	39,200	56,000	43,200	12,400	13,200	15,400
11	13,600	17,000	11,600	12,000	15,200	18,100	38,300	53,500	39,400	14,800	12,700	12,700
12	14,700	18,300	11,300	12,200	15,400	17,400	41,900	51,800	37,000	16,300	11,700	9,210
13	16,300	18,300	9,000	12,300	15,500	16,400	46,400	49,700	32,000	15,600	10,600	9,870
14	17,000	17,700	8,400	12,400	15,300	15,300	50,300	51,200	33,200	15,800	10,100	11,100
15	17,500	16,700	11,400	14,500	15,100	16,900	49,600	52,600	34,300	14,600	9,200	11,100
16	19,100	16,900	14,300	14,500	14,800	18,900	51,200	51,000	32,300	16,600	9,950	10,700
17	17,300	17,700	14,400	14,500	14,700	19,500	52,800	47,400	32,300	16,300	10,500	10,600
18	13,900	18,600	14,700	14,300	14,700	18,500	53,100	46,500	36,000	15,900	10,700	9,540
19	13,400	16,000	15,400	14,100	13,800	18,100	51,000	46,400	35,700	16,200	9,200	10,500
20	13,000	14,300	15,400	14,200	13,700	22,500	50,800	43,500	33,800	16,700	9,940	9,980
21	12,000	13,400	15,300	14,000	13,700	21,400	51,600	40,800	35,300	17,000	9,900	8,720
22	13,200	13,300	15,100	13,900	13,900	19,900	52,400	41,100	35,200	17,100	9,300	9,440
23	15,200	13,800	12,300	14,000	14,000	19,900	52,600	42,600	32,800	16,900	9,200	11,900
24	15,600	13,900	12,700	14,100	15,500	19,900	54,200	41,400	31,500	13,800	9,200	12,000
25	15,100	12,700	12,700	14,200	15,400	20,100	54,800	40,200	30,900	12,800	8,500	13,400
26	14,600	13,500	12,800	15,900	15,700	20,600	54,400	41,400	29,100	12,900	8,000	14,600
27	15,400	13,400	12,800	15,500	14,000	21,500	56,000	41,500	28,700	13,100	8,000	15,100
28	15,200	16,200	12,800	15,200	13,900	21,400	57,600	44,900	29,200	14,100	9,000	11,200
29	14,000	18,300	12,800	13,500	------	20,500	59,200	50,300	27,700	14,900	11,700	9,400
30	13,300	17,900	14,700	13,600	------	20,000	61,100	52,200	24,800	15,900	10,800	8,960
31	14,800	------	14,500	13,900	------	21,900	------	51,100	------	15,600	9,300	------
TOTAL	442,300	486,400	434,500	431,100	400,200	575,400	1,298.1M	1,590.9M	1,175.9M	508,600	332,990	316,520
MEAN	14,270	16,210	14,020	13,910	14,290	18,560	43,270	51,320	39,200	16,410	10,740	10,550
MAX	19,100	18,800	18,500	15,900	15,700	22,500	61,100	63,600	57,000	25,600	14,800	15,400
MIN	10,800	12,700	8,400	12,000	11,100	13,900	21,500	40,200	24,800	12,000	8,000	6,700
CFSM	.24	.27	.24	.24	.24	.31	.73	.87	.66	.28	.18	.18
IN.	.28	.31	.27	.27	.25	.36	.82	1.00	.74	.32	.21	.20

CAL YR 1969 TOTAL 12,841,910 MEAN 35,180 MAX 218,000 MIN 8,400 CFSM .59 IN 8.07
WTR YR 1970 TOTAL 7,992,910 MEAN 21,900 MAX 63,600 MIN 6,700 CFSM .37 IN 5.02

M expressed in thousands.

05384000 Root River near Lanesboro, Minn.

LOCATION.--Lat 43°44'58", long 91°58'43", in sec.1, T.103 N., R.10 W., Fillmore County, on left bank half a mile upstream from highway bridge, 1.2 miles upstream from South Branch, and 2.5 miles northeast of Lanesboro.

DRAINAGE AREA.--615 sq mi.

PERIOD OF RECORD.--February to November 1910, February 1911 to September 1914. July 1915 to September 1917, August 1940 to current year.

GAGE.--Water-stage recorder. Datum of gage is 791.84 ft above mean sea level, adjustment of 1912. Prior to Oct. 1, 1917, nonrecording gage at site half a mile downstream at datum about 1.5 ft higher.

AVERAGE DISCHARGE.--35 years (1911-14, 1915-17, 1940-70), 314 cfs (6.93 inches per year).

EXTREMES.--Current year: Maximum discharge, 2,430 cfs May 29 (gage height, 5.71 ft); minimum, 90 cfs Nov. 20 (gage height, 1.01 ft).
Period of record: Maximum discharge 22,100 cfs Mar. 29, 1962 (gage height, 16.11 ft); maximum gage height, 17.83 ft Mar. 1, 1965, from floodmark, backwater from ice; minimum discharge, 29 cfs Aug. 27, 1949 (gage height, 1.08 ft); minimum gage height, 0.80 ft Dec. 15, 1967.

REMARKS.--Records good except those for winter periods, which are fair. Diurnal fluctuation at times during medium and low flow caused by powerplant above station. Records of suspended sediment loads for the water year 1970 are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 355: 1912. WSP 1308: 1911(M).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	143	168	146	107	113	128	288	309	1,290	274	322	132
2	148	168	140	107	115	128	291	304	830	267	267	137
3	145	170	129	107	115	138	288	295	638	260	231	142
4	141	165	125	107	115	170	297	283	533	250	209	144
5	141	161	120	106	115	299	300	268	471	241	196	139
6	148	156	119	105	117	280	355	257	424	233	187	140
7	143	154	117	105	120	270	463	251	389	227	180	144
8	137	152	116	105	120	255	595	247	358	222	181	139
9	137	148	115	105	128	242	649	241	328	213	182	142
10	135	145	114	105	128	235	534	250	310	208	178	162
11	133	145	114	105	128	230	428	249	297	203	173	156
12	135	143	114	105	128	225	372	259	331	198	169	149
13	175	143	114	105	128	218	362	286	829	196	166	139
14	208	125	112	105	128	215	379	372	491	211	162	139
15	192	118	112	105	128	215	418	766	677	207	158	151
16	187	117	111	105	128	218	460	867	1,020	195	154	163
17	190	114	111	105	128	224	432	623	725	187	150	166
18	180	112	111	105	128	247	407	495	1,390	182	157	161
19	175	111	111	105	128	261	379	427	632	257	154	156
20	168	111	111	105	128	294	404	371	525	365	150	152
21	161	112	110	105	128	282	690	337	556	263	144	149
22	154	114	110	105	128	273	681	329	509	224	142	149
23	150	118	110	105	128	291	550	319	446	211	140	150
24	145	120	110	105	128	318	526	305	404	195	138	155
25	145	123	109	105	128	321	490	307	371	186	136	160
26	143	126	109	105	128	369	428	1,190	359	179	135	161
27	141	130	109	105	128	393	393	705	341	193	134	159
28	141	130	108	107	128	344	365	1,140	323	203	131	155
29	139	135	107	110	------	327	344	1,830	306	229	132	148
30	141	144	107	110	------	318	323	877	290	360	133	144
31	156	------	107	111	------	300	------	634	------	371	131	------
TOTAL	4,777	4,078	3,558	3,282	3,490	8,028	12,891	15,393	16,393	7,210	5,222	4,483
MEAN	154	136	115	106	125	259	430	497	546	233	168	149
MAX	208	170	146	111	128	393	690	1,830	1,390	371	322	166
MIN	133	111	107	105	113	128	288	241	290	179	131	132
CFSM	.25	.22	.19	.17	.20	.42	.70	.81	.89	.38	.27	.24
IN.	.29	.25	.22	.20	.21	.49	.78	.93	.99	.44	.32	.27

CAL YR 1969 TOTAL 132,483 MEAN 363 MAX 5,760 MIN 107 CFSM .59 IN 8.01
WTR YR 1970 TOTAL 88,805 MEAN 243 MAX 1,830 MIN 105 CFSM .40 IN 5.37

PEAK DISCHARGE (BASE, 3,500 CFS).--No peak above base.

05384500 Rush Creek near Rushford, Minn.

LOCATION.--Lat 43°50'00", long 91°46'40", on line between secs. 3 and 10, T.104 N., R.8 W., Fillmore County, on downstream side near center of span of highway bridge, 1.5 miles northwest of Rushford and 3 miles upstream from mouth.

DRAINAGE AREA.--129 sq mi.

PERIOD OF RECORD.--August 1942 to current year.

GAGE.--Nonrecording gage read twice daily. Datum of gage is 735.00 ft above mean sea level, adjustment of 1912. Prior to June 14, 1950, water-stage recorder at site 100 ft upstream; at datum 5 ft higher, Aug. 5, 1942, to Oct. 27, 1945; at datum 3 ft higher, Oct. 28, 1945, to Aug. 3, 1949; at present datum, Aug. 4, 1949, to June 13, 1950.

AVERAGE DISCHARGE.--28 years, 52.9 cfs (5.57 inches per year).

EXTREMES.--Current year: Maximum discharge, 1.640 cfs June 18 (gage height, 5.64 ft, from crest-stage gage); minimum daily, 31 cfs Jan. 5-10; minimum gage height, 1.02 ft Feb. 28, Aug. 4, 5, 24, 31, Sept. 1.
Period of record: Maximum discharge, 11,600 cfs Mar. 26, 1950 (gage height 13.54 ft, from floodmark), from rating curve extended above 1,400 cfs on basis of contracted-opening measurements at gage heights 11.0 and 13.5 ft; minimum, 17 cfs May 22, 1959; minimum gage height, 0.93 ft June 16, 17, 18, 1965.
Flood of June 28, 29, 1942 reached a discharge of 11,000 cfs (by slope-area measurement of peak flow).

REMARKS.--Records fair.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	35	38	36	36	44	37	39	42	49	43	37	38
2	35	38	36	36	41	36	39	41	47	43	37	38
3	35	38	36	35	37	54	39	41	46	42	37	38
4	35	37	36	32	36	46	39	41	44	41	36	38
5	34	37	36	31	37	44	38	40	43	41	36	38
6	37	37	36	31	37	43	41	40	43	42	36	41
7	36	37	37	31	37	41	41	40	43	41	36	38
8	36	37	38	31	37	41	41	40	43	41	38	38
9	36	37	38	31	37	40	41	40	42	40	37	43
10	36	37	36	31	37	40	40	41	42	39	36	41
11	36	37	36	32	37	38	40	40	41	39	36	38
12	36	37	36	32	37	38	41	40	41	40	36	38
13	44	37	36	32	37	38	44	43	45	40	36	38
14	38	36	36	32	37	38	44	47	83	41	36	38
15	38	37	35	34	37	38	43	45	99	40	36	41
16	42	37	35	36	37	37	42	43	73	40	37	41
17	40	37	35	36	37	37	42	43	159	40	37	40
18	37	37	35	36	37	37	42	42	457	40	38	40
19	37	37	35	36	37	37	43	41	79	42	37	40
20	37	37	35	36	37	38	46	41	60	40	37	40
21	37	37	35	36	37	38	43	39	55	38	37	40
22	37	37	35	36	37	40	46	41	51	39	37	40
23	37	36	35	36	37	40	44	41	49	38	37	40
24	37	36	35	37	37	41	43	42	48	38	37	39
25	37	36	36	37	37	39	43	43	47	38	38	40
26	37	36	36	37	37	39	43	43	45	38	37	40
27	37	34	36	37	37	40	42	43	44	39	38	38
28	37	34	36	37	37	38	42	72	44	39	38	38
29	37	34	36	38	------	40	42	53	44	40	38	39
30	37	36	36	37	------	40	41	50	43	39	38	39
31	37	------	36	45	------	38	------	49	------	37	37	------
TOTAL	1,147	1,098	1,111	1,080	1,046	1,231	1,254	1,347	2,049	1,238	1,144	1,178
MEAN	37.0	36.6	35.8	34.8	37.4	39.7	41.8	43.5	68.3	39.9	36.9	39.3
MAX	44	38	38	45	44	54	46	72	457	43	38	43
MIN	34	34	35	31	36	36	38	39	41	37	36	38
CFSM	.29	.28	.28	.27	.29	.31	.32	.34	.53	.31	.29	.30
IN.	.33	.32	.32	.31	.30	.35	.36	.39	.59	.36	.33	.34

CAL YR 1969 TOTAL 15,147 MEAN 41.5 MAX 309 MIN 33 CFSM .32 IN 4.37
WTR YR 1970 TOTAL 14,923 MEAN 40.9 MAX 457 MIN 31 CFSM .32 IN 4.30

05385000 Root River near Houston, Minn.

LOCATION.--Lat 43°46'05", long 91°35'11", in sec.32, T.104 N., R.6 W., Houston County, on right bank 1 mile west of Houston and 2.5 miles upstream from South Fork.

DRAINAGE AREA.--1,270 sq mi, approximately.

PERIOD OF RECORD.--May 1909 to September 1917, May to November 1929, March 1930 to current year. Monthly discharge only for some periods, published in WSP 1308.

GAGE.--Water-stage recorder. Datum of gage is 671.86 ft above mean sea level, datum of 1929. May 28, 1909, to Sept. 30, 1917, nonrecording gage at site 1.5 miles downstream at different datum. May 4, 1929, to Sept. 27, 1933, nonrecording gage at present site and datum.

AVERAGE DISCHARGE.--48 years (1909-17, 1930-70), 636 cfs (6.80 inches per year).

EXTREMES.--Current year: Maximum discharge, 2,250 cfs June 18 (gage height, 4.74 ft); maximum gage height, 5.00 ft Mar. 3 (backwater from ice); minimum daily, 260 cfs Jan. 11-20.
Period of record: Maximum discharge, 37,000 cfs Apr. 1, 1952 (gage height, 13.90 ft); maximum gage height, 18.32 ft Mar. 2, 1965 (backwater from ice); minimum discharge, 65 cfs Dec. 26, 1933, Feb. 25, 1935.

REMARKS.--Records good except those for periods of no gage-height record and those for winter periods, which are fair. Slight diurnal fluctuation at low flows caused by powerplants above station. Records of chemical analyses, water temperatures and suspended sediment loads for the water year 1970 are published in Part 2 of this report.

REVISIONS (WATER YEARS).--WSP 895: Drainage area. WSP 1508: 1911-12. WSP 1625: 1948(P).

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	367	401	367	300	270	305	584	603	1,160	565	598	322
2	379	405	358	295	270	305	575	575	1,280	542	547	318
3	375	401	342	290	270	540	575	565	1,070	533	479	322
4	358	396	346	285	270	620	570	552	937	520	448	334
5	350	392	350	280	275	520	575	538	849	484	426	338
6	375	388	354	275	275	470	594	524	808	470	405	334
7	375	379	358	273	280	440	665	520	729	457	396	334
8	354	375	358	268	280	420	783	520	685	448	409	322
9	350	375	350	265	280	415	900	510	651	439	401	354
10	330	375	358	265	280	410	890	506	622	435	396	575
11	334	375	350	260	290	405	798	524	612	422	388	466
12	330	379	350	260	297	405	729	533	622	409	371	388
13	418	371	350	260	297	405	704	570	798	405	371	367
14	414	367	350	260	297	410	689	651	1,090	422	358	354
15	422	371	350	260	298	420	685	798	849	401	354	426
16	448	371	349	260	298	435	738	1,140	1,260	396	346	392
17	422	365	348	260	298	470	753	1,070	1,090	392	342	396
18	405	365	347	260	298	510	724	926	1,810	384	350	388
19	405	360	346	260	298	529	704	828	1,210	418	350	379
20	409	363	345	260	298	579	719	753	973	533	346	367
21	405	360	345	262	300	598	758	694	921	533	342	367
22	396	370	342	262	302	589	1,030	655	906	470	338	358
23	384	370	340	262	304	561	916	651	828	422	322	346
24	375	379	335	262	305	598	823	627	768	414	318	388
25	363	384	325	262	305	612	803	646	729	401	330	388
26	354	371	320	262	305	631	748	788	685	375	318	388
27	346	367	320	265	305	675	694	1,220	651	409	326	375
28	350	363	315	265	305	670	660	1,110	631	405	322	371
29	354	358	315	265	------	641	627	1,660	608	461	326	358
30	358	363	310	265	------	631	612	1,460	584	484	314	358
31	401	------	305	270	------	612	------	1,100	------	589	310	------
TOTAL	11,706	11,259	10,598	8,298	8,150	15,831	21,625	23,817	26,416	14,038	11,647	11,173
MEAN	378	375	342	268	291	511	721	768	881	453	376	372
MAX	448	405	367	300	305	675	1,030	1,660	1,810	589	598	575
MIN	330	358	305	260	270	305	570	506	584	375	310	318
CFSM	.30	.30	.27	.21	.23	.40	.57	.60	.69	.36	.30	.29
IN.	.34	.33	.31	.24	.24	.46	.63	.70	.77	.41	.34	.33

CAL YR 1969 TOTAL 244,591 MEAN 670 MAX 7,800 MIN 270 CFSM .53 IN 7.16
WTR YR 1970 TOTAL 174,558 MEAN 478 MAX 1,810 MIN 260 CFSM .38 IN 5.11

PEAK DISCHARGE (BASE, 5,000 CFS).--No peak above base

NOTE.--No gage-height record Jan. 19 to Feb. 11, Feb. 13 to Mar. 16.

05385500 South Fork Root River near Houston, Minn.

LOCATION.--Lat 43°44'19", long 91°33'50", in NE¼SW¼ sec.9, T.103 N., R.6 W., Houston County, on left bank 50 ft downstream from bridge on State Highway 76, half a mile upstream from Badger Creek and 1.5 miles south of Houston.

DRAINAGE AREA.--275 sq mi.

PERIOD OF RECORD.--January 1953 to current year.

GAGE.--Water-stage recorder. Datum of gage is 680.41 ft above mean sea level, datum of 1929.

AVERAGE DISCHARGE.--17 years, 118 cfs (5.83 inches per year).

EXTREMES.--Current year: Maximum discharge, 1,160 cfs Sept. 10 (gage height, 8.18 ft); minimum 71 cfs Feb. 28 (gage height, 1.40 ft).
Period of record: Maximum discharge 8,420 cfs Mar. 29, 1962 (gage height, 13.35 ft); maximum gage height, 13.74 ft Mar. 26, 1961 (backwater from ice); minimum discharge, 11 cfs Nov. 28, 1961 (gage height, 1.47 ft); minimum gage height, 0.85 ft Aug. 17, 1967.

REMARKS.--Records good except those for winter periods, which are fair.

REVISIONS (WATER YEARS).--WSP 1388: 1953.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	85	95	86	76	84	80	101	95	153	100	95	76
2	84	93	86	75	84	78	100	95	116	98	92	78
3	83	92	86	74	84	180	100	93	110	97	85	78
4	82	91	87	73	84	260	97	91	110	95	83	78
5	82	90	89	73	86	197	97	89	108	94	82	75
6	89	89	88	73	90	170	99	88	105	93	81	78
7	88	89	90	73	95	157	100	88	103	94	81	79
8	87	84	90	73	98	144	99	87	101	94	83	76
9	85	87	87	73	100	130	99	86	99	95	86	126
10	83	87	86	73	102	120	97	85	97	94	85	725
11	83	87	87	73	104	115	95	99	99	93	82	162
12	84	87	89	73	105	112	95	102	107	91	81	109
13	103	87	90	73	102	110	103	123	168	91	80	98
14	100	88	86	73	100	107	104	131	157	92	79	92
15	97	88	86	73	96	105	101	150	124	90	79	111
16	102	88	86	73	96	103	100	136	209	89	78	119
17	99	89	86	73	96	101	96	127	157	88	78	109
18	96	92	86	73	96	102	96	123	125	87	79	103
19	94	90	86	73	90	105	100	116	115	94	79	101
20	94	91	86	73	90	112	113	112	116	97	77	91
21	92	97	85	73	95	110	112	107	130	89	76	94
22	91	89	84	74	97	107	111	107	121	86	76	94
23	90	88	84	74	94	111	107	108	113	85	76	90
24	90	88	83	74	86	116	105	113	110	84	75	99
25	89	87	82	74	82	111	102	118	107	83	76	97
26	89	87	82	75	86	110	101	125	106	82	76	96
27	89	87	81	77	84	108	99	117	106	84	75	92
28	89	88	80	80	82	106	96	127	104	83	74	91
29	88	86	79	82	------	104	96	118	103	120	75	88
30	88	86	78	83	------	103	94	113	101	120	76	87
31	96	------	77	84	------	102	------	119	------	97	74	------
TOTAL	2,791	2,667	2,638	2,316	2,588	3,776	3,015	3,388	3,580	2,879	2,474	3,492
MEAN	90.0	88.9	85.1	74.7	92.4	122	101	109	119	92.9	79.8	116
MAX	103	97	90	84	105	260	113	150	209	120	95	725
MIN	82	84	77	73	82	78	94	85	97	82	74	75
CFSM	.33	.32	.31	.27	.34	.44	.37	.40	.43	.34	.29	.42
IN.	.38	.36	.36	.31	.35	.51	.41	.46	.48	.39	.33	.47

CAL YR 1969 TOTAL 41,253 MEAN 113 MAX 1,260 MIN 71 CFSM .41 IN 5.58
WTR YR 1970 TOTAL 35,604 MEAN 97.5 MAX 725 MIN 73 CFSM .35 IN 4.81

PEAK DISCHARGE (BASE, 900 CFS).--Sept. 10 (0515) 1,160 cfs (8.18 ft)

05457000 Cedar River near Austin, Minn.

LOCATION.--Lat 43°38'10", long 92°58'20", in NE¼SE¼ sec.15, T.102 N., R.18 W., Freeborn County, on left bank 200 ft upstream from abandoned powerhouse, 500 ft downstream from highway bridge, 1.1 miles downstream from Turtle Creek, and 1.1 miles south of Austin.

DRAINAGE AREA.--425 sq mi.

PERIOD OF RECORD.--May 1909 to September 1914, October 1944 to current year.

GAGE.--Water-stage recorder. Datum of gage is 1,162.10 ft above mean sea level, datum of 1929. May 1909 to April 1912, nonrecording gage in tailwater of powerplant 200 ft downstream at datum 3.1 ft lower. May 1912 to September 1914, nonrecording gage on highway bridge 500 ft downstream at datum 1.1 ft lower.

AVERAGE DISCHARGE.--31 years, 173 cfs (5.53 inches per year).

EXTREMES.--Current year: Maximum discharge, 1,430 cfs May 29 (gage height, 5.96 ft); minimum, 25 cfs Feb. 2 (gage height, 2.19 ft).
Period of record: Maximum discharge, 9,530 cfs Mar. 29, 1962 (gage height, 17.18 ft); maximum gage height, 18.87 ft Mar. 1, 1965 (from floodmark, backwater from ice); no flow for several days in 1911.

REMARKS.--Records good.

REVISIONS (WATER YEARS).--WSP 1145: 1945: 1945, 1948.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	79	88	68	61	52	52	205	189	364	98	171	70
2	88	90	68	66	64	53	205	177	276	98	116	72
3	88	90	63	63	65	121	218	165	224	86	93	78
4	82	88	63	61	53	90	205	162	192	74	78	72
5	73	86	68	59	48	105	234	150	171	68	70	66
6	75	84	66	57	50	132	321	135	150	70	68	68
7	69	82	70	55	48	156	434	129	135	70	74	66
8	66	77	68	60	48	162	524	123	126	70	83	63
9	63	71	70	57	50	150	434	138	118	66	72	70
10	63	75	68	48	52	144	285	129	116	63	72	74
11	63	73	68	50	52	138	221	138	132	59	72	66
12	71	73	66	52	50	141	192	162	196	57	74	66
13	88	84	66	52	50	138	228	221	159	76	68	57
14	75	59	63	53	48	141	282	427	138	76	66	63
15	82	69	57	53	47	121	346	588	144	74	66	86
16	94	64	66	55	48	123	342	472	159	66	59	72
17	79	84	66	53	50	129	328	342	174	70	55	81
18	77	82	68	63	48	162	263	269	168	63	61	72
19	75	61	63	64	47	218	269	228	147	250	66	66
20	77	69	59	64	47	224	616	196	165	183	59	61
21	75	66	59	64	48	212	905	177	150	116	55	83
22	71	68	61	57	52	199	572	183	144	81	57	63
23	68	66	61	55	53	212	556	174	129	68	53	59
24	66	69	63	53	57	202	548	177	121	63	59	63
25	66	71	57	52	52	231	364	295	108	59	59	78
26	68	71	61	55	57	260	292	756	171	55	61	72
27	68	66	63	57	53	256	253	456	150	81	61	66
28	64	66	61	57	50	218	224	401	116	86	61	63
29	68	66	63	55	------	215	208	1,150	108	183	59	61
30	75	64	63	55	------	196	189	552	100	202	59	57
31	90	------	63	52	------	180	------	456	------	224	59	------
TOTAL	2,306	2,222	1,989	1,758	1,439	5,081	10,263	9,317	4,751	2,955	2,186	2,054
MEAN	74.4	74.1	64.2	56.7	51.4	164	342	301	158	95.3	70.5	68.5
MAX	94	90	70	66	65	260	905	1,150	364	250	171	86
MIN	63	59	57	48	47	52	189	123	100	55	53	57
CFSM	.18	.17	.15	.13	.12	.39	.80	.71	.37	.22	.17	.16
IN.	.20	.19	.17	.15	.13	.44	.90	.82	.42	.26	.19	.18

CAL YR 1969 TOTAL 90,372 MEAN 248 MAX 3,270 MIN 57 CFSM .58 IN 7.91
WTR YR 1970 TOTAL 46,321 MEAN 127 MAX 1,150 MIN 47 CFSM .30 IN 4.05

PEAK DISCHARGE (BASE, 1,400 CFS).--May 29 (0645) 1,430 cfs (5.96 ft).

05476000 Des Moines River at Jackson, Minn.
(Formerly published as West Fork Des Moines River at Jackson)

LOCATION.--Lat 43°37'10", long 94°59'10", in SE¼SW¼ sec.24. T.102 N., R.35 W., Jackson County, on right bank in storage room of city powerplant in Jackson.

DRAINAGE AREA.--1,220 sq mi, approximately.

PERIOD OF RECORD.--May 1909 to December 1913, August 1930 to current year (winter records incomplete prior to 1936). Published as Des Moines River near Jackson, 1930-35, as West Fork Des Moines River near Jackson, 1936-44, and as West Fork Des Moines River at Jackson, 1945-69.

GAGE.--Water-stage recorder. Datum of gage is 1,287.75 ft above mean sea level, datum of 1929. May 31, 1909, to Dec. 20, 1913, nonrecording gage at site 0.6 mile downstream at datum 0.99 ft lower. Aug. 22, 1930, to Sept. 30, 1944, nonrecording gage at site 7 miles upstream at datum 17.10 ft higher. Oct. 1, 1944, to Oct. 26, 1949, nonrecording gage at site 600 ft upstream at datum 10.64 ft higher. Oct. 27, 1949 to Dec. 15, 1965, water-stage recorder 200 ft downstream at same datum.

AVERAGE DISCHARGE.--35 years (1935-70), 281 cfs (3.13 inches per year).

EXTREMES.--Current year: Maximum discharge, 1,680 cfs Apr. 7 (gage height, 9.07 ft) minimum daily, 18 cfs many days.
Period of record: Maximum discharge 15,700 cfs Apr. 11, 1969 (gage height, 19.45 ft); no flow at times.

REMARKS.--Records good except those for winter periods, which are fair. Regulation at times by Yankton, Long, Shetek, and Heron Lakes. Records of chemical analyses, water temperatures, and suspended sediment loads for the current year are published in Part 2 of this report.

DISCHARGE, IN CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	30	59	43	25	19	18	145	966	242	159	136	44
2	43	62	45	25	19	18	165	914	240	149	126	44
3	37	66	44	24	19	100	200	848	237	128	120	48
4	35	66	42	24	19	99	250	775	244	121	111	45
5	35	66	40	23	19	98	400	692	237	109	106	40
6	40	65	38	23	19	95	874	616	223	106	104	36
7	44	64	37	23	18	93	1,360	560	210	102	114	40
8	44	64	36	22	18	94	1,340	528	197	101	205	43
9	40	64	35	22	18	95	1,280	471	187	94	219	55
10	38	65	33	22	18	96	1,390	418	185	91	268	40
11	34	59	35	22	18	97	1,400	387	183	86	297	33
12	38	55	37	21	18	97	1,330	373	173	66	268	31
13	51	51	41	21	18	97	1,270	390	173	91	223	30
14	48	36	44	21	18	97	1,190	421	175	367	221	30
15	51	34	45	21	18	97	1,150	409	205	636	175	33
16	61	34	44	21	18	97	1,140	398	324	587	153	40
17	61	33	43	21	18	98	1,120	353	334	401	135	48
18	58	20	41	21	18	102	1,050	334	302	589	123	45
19	58	21	40	20	18	109	1,040	302	264	528	114	41
20	58	22	38	20	18	111	1,160	271	249	457	108	34
21	56	27	36	20	18	115	1,220	254	256	337	102	33
22	58	31	34	20	18	117	1,200	258	258	274	94	32
23	59	35	32	20	18	118	1,160	258	256	240	91	32
24	59	39	31	20	18	119	1,180	268	246	207	80	33
25	55	44	29	20	18	120	1,190	276	228	183	76	37
26	52	45	28	20	18	120	1,170	264	210	149	72	36
27	55	43	28	20	18	120	1,150	240	199	108	64	32
28	51	43	27	20	18	121	1,150	228	187	114	59	30
29	52	43	26	19	------	122	1,100	240	181	120	56	27
30	52	43	26	19	------	124	1,040	251	167	155	55	32
31	55	------	26	19	------	130	------	249	------	153	48	------
TOTAL	1,508	1,399	1,124	659	510	3,134	30,814	13,212	6,772	7,008	4,123	1,124
MEAN	48.6	46.6	36.3	21.3	18.2	101	1,027	426	226	226	133	37.5
MAX	61	66	45	25	19	130	1,400	966	334	636	297	55
MIN	30	20	26	19	18	18	145	228	167	66	48	27
CFSM	.040	.038	.030	.018	.015	.083	.84	.35	.19	.19	.11	.031
IN.	.05	.04	.03	.02	.02	.10	.94	.40	.21	.21	.13	.03

CAL YR 1969 TOTAL 321,604 MEAN 881 MAX 15,500 MIN 20 CFSM .72 IN 9.81
WAT YR 1970 TOTAL 71,387 MEAN 196 MAX 1,400 MIN 18 CFSM .16 IN 2.18

PEAK DISCHARGE (BASE, 500 CFS)

DATE	TIME	G.HT.	DISCHARGE	DATE	TIME	G.HT.	DISCHARGE
4-7	2300	9.07	1680	7-18	0500	6.44	812
7-15	1630	6.07	696				

As the number of streams on which streamflow information is likely to be desired far exceeds the number of stream-gaging stations feasible to operate at one time, the Geological Survey collects limited streamflow data at sites other than stream-gaging stations. When limited streamflow data are collected on a systematic basis over a period of years for use in hydrologic analyses, the site at which the data are collected is called a partial-record station. Data collected at these partial-record stations are usable in low-flow or flood-flow analyses, depending on the type of data collected. In addition, discharge measurements are made at other sites not included in the partial-record program. These measurements are generally made in times of drought or flood to give better areal coverage to those events. Those measurements and others collected for some special reason are called measurements at miscellaneous sites.

Records collected at partial-record stations are presented in two tables. The first is a table of discharge measurements at low-flow partial-record stations and the second is a table of annual maximum stage and discharge at crest-stage stations. Discharge measurements made at miscellaneous sites for both low flow and high flow are given in a third table.

Low-flow partial-record stations

Measurements of streamflow in the area covered by this report made at low-flow partial-record stations are given in the following table. Most of these measurements were made during periods of base flow when streamflow is primarily from ground-water storage. These measurements, when correlated with the simultaneous discharge of a nearby stream when continuous records are available, will give a picture of the low-flow potentiality of the stream. The column headed "Period of record" shows the water years in which measurements were made at the same, or practically the same, site.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Streams tributary to Lake Superior				
04010850	Brule River near Grand Marais, Minn.	SE¼SW¼ sec.15, T.63 N., R.1 E., Cook County, at bridge on National Forest Development Road 309, 0.5 mile upstream from South Brule River and 12.5 miles north of Grand Marais.	-	1970	8-12-70	16.5
04010900	South Brule River near Grand Marais, Minn.	SW¼NE¼ sec.22, T.63 N., R.1 E., Cook County, at bridge on County Highway 12 (Gunflint Trail), 300 feet upstream from mouth, and 12 miles north of Grand Marais.	-	1970	8-12-70	35.7
04011000	Brule River near Hovland, Minn.	SE¼SW¼ sec.27, T.62 N., R.3 E., Cook County, at bridge on U.S. Highway 61, 0.3 miles upstream from mouth, and 4.5 miles southwest of Hovland.	248	1912, 1970	8-17-70	65.8
04011500	Devil Track River near Grand Marais, Minn.	SW¼NE¼ sec.13, T.61 N., R.1 E., Cook County, at bridge on U.S. Highway 61, 400 ft upstream from mouth, and 3.9 miles northeast of Grand Marais.	a77	1911-12, 1970	8-12-70	22.6
04012000	Cascade River near Grand Marais, Minn.	NE¼SW¼ sec.1, T.60 N., R.2 W., Cook County, at U.S. Highway 61, at mouth, and 9.2 miles southwest of Grand Marais.	111	1911-12, 1970	8-12-70	21.0
04012500	Poplar River at Lutsen, Minn.	SW¼NE¼ sec.33, T.60 N., R.3 W., Cook County, 350 feet upstream from bridge on U.S. Highway 61 at Lutsen, and 1,650 feet upstream from mouth.	114	1911, 1912-17≠, 1928-47≠, 1952-61≠, 1962-63, 1970	8-12-70	52.2
04012600	Temperance River near Tofte, Minn.	NE¼NW¼ sec.4, T.61 N., R.4 W., Cook County, at bridge on Forest Service Road 165, 1.8 miles downstream from Sawbill Creek, and 15.5 miles north of Tofte.	-	1970	8-12-70	43.2
04012700	Temperance River near Schroeder, Minn.	SE¼NE¼ sec.31, T.59 N., R.4 W., Cook County, at bridge on U.S. Highway 61, 500 feet upstream from mouth, and 1.2 miles northeast of Schroeder.	a189	1911-12, 1970	8-12-70	54.5
04013300	Manitou River near Little Marais, Minn.	SE¼SE¼ sec.3, T.57 N., R.6 W., Lake County, at bridge on U.S. Highway 61, 0.3 mile upstream from mouth, and 3 miles northeast of Little Marais.	a94	1911-12, 1970	8-13-70	5.48
04015000	Beaver River at Beaver Bay, Minn.	SE¼SW¼ sec.12, T.55 N., R.8 W., Lake County, at bridge on U.S. Highway 61, 800 feet upstream from mouth, at Beaver Bay.	126	b1911-14≠, b1928-31≠, 1968, 1970	8-13-70	.74

≠ Operated as a continuous-record gaging station.
a Approximately.
b Published as Beaver Bay River at Beaver Bay, Minn.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Streams tributary to Lake Superior--Continued				
04015140	Gooseberry River near Two Harbors, Minn.	SW¼SW¼ sec.22, T.154 N., R.9 W., Lake County, at bridge on U.S. Highway 61, in Gooseberry Falls State Park, about one mile upstream from mouth, 2.5 miles northeast of Castle Danger, and 12.5 miles northeast of Two Harbors.	a77	1911, 1963, 1970	8-11-70	1.41
04015330	Knife River near Two Harbors, Minn.	SE¼NE¼ sec.36, T.52 N., R.12 W., St. Louis County, at north bridge on U.S. Highway 61, 0.8 mile upstream from mouth, and 8 miles southwest of Two Harbors.	a90	1970	8-11-70	2.02
04015340	Sucker River near Duluth, Minn.	SE¼SW¼ sec.3, T.51 N., R.12 W., St. Louis County, at culvert on County Highway 61, 0.2 mile upstream from mouth, and 15.3 miles northeast of aerial bridge in Duluth.	a34	1970	8-10-70	3.52
04015350	French River near Duluth, Minn.	NE¼SW¼ sec.17, T.51 N., R.12 W., St. Louis County, at bridge on County Highway 61 at mouth, and 12.7 miles northeast of aerial bridge in Duluth.	-	1970	8-10-70	.70
04015387	Amity Creek at Duluth, Minn.	SE¼NE¼ sec.5, T.50 N., R.13 W., St. Louis County, at bridge on Parkway Road, 0.4 mile upstream from Lester River and 6 miles northeast of aerial bridge in Duluth.	-	1970	8-10-70	.05
04015390	Lester River at Duluth, Minn.	NE¼NE¼ sec.8, T.50 N., R.13 W., St. Louis County, at bridge on U.S. Highway 61 at mouth, and 5.7 miles northeast of aerial bridge in Duluth.	a56	1970	8-10-70	1.36
04018710	Mud Hen Creek near Forbes, Minn.	SE¼SE¼ sec.3, T.56 N., R.17 W., St. Louis County, at bridge on County Highway 16, 0.9 mile upstream from mouth, 4.5 miles north of Central Lakes, and 6 miles southeast of Forbes.	a118	1970	8-12-70	3.49
04020800	Paleface River near Cotton, Minn.	NW¼NW¼ sec.34, T.55 N., R.17 W., St. Louis County, at bridge on U.S. Highway 53, about two miles upstream from mouth, and 2.9 miles north of Cotton.	a60	1970	8-12-70	.17
04021200	Floodwood River near Floodwood, Minn.	SW¼SW¼ sec.20, T.52 N., R.20 W., St. Louis County, at bridge on farm driveway, 3.8 miles upstream from mouth, and 2.8 miles north of Floodwood.	-	1970	8-14-70	4.12
04021250	East Savanna River at Floodwood, Minn.	SE¼NE¼ sec.7, T.51 N., R.20 W., St. Louis County, at bridge on U.S. Highway 2, 0.4 mile upstream from mouth, at Floodwood.	-	1970	8-14-70	.13
04021530	Stoney Brook at Brookston, Minn.	NW¼SE¼ sec.34, T.51 N., R.18 W., St. Louis County, at bridge on County Highway 31, 0.8 mile upstream from mouth, at Brookston.	a105	1970	8-13-70	8.84
04021700	Cloquet River near Brimson, Minn.	SE¼SW¼ sec.9, T.55 N., R.12 W., St. Louis County, at bridge on County Highway 52 (Forest Service Road 6202), about one mile upstream from Pine Creek, and 1.5 miles south of Brimson.	-	1970	8-13-70	8.11
04021960	Cloquet River near Island Lake, Minn.	SW¼SW¼ sec.32, T.54 N., R.13 W., St. Louis County, at boat launching site on State Forest Road (Carroll Forest Road), 1.7 miles upstream from Little Cloquet River, and 7.5 miles northeast of village of Island Lake.	-	1970	8-12-70	18.1
04022970	Us-Kab-Wan-Ka River near Twig, Minn.	SE¼SW¼ sec.14, T.52 N., R.16 W., St. Louis County, at bridge on trail, 0.8 mile upstream from mouth, and 6.2 miles north of Twig.	-	1970	8-13-70	2.57

a Approximately.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Streams tributary to Lake Superior--Continued				
04023400	Pine River near Cloquet, Minn.	On line between secs.23 and 24, T.50 N., R.17 W., St. Louis County, at concrete box culvert on State Highway 33, 0.9 mile upstream from mouth, and 5.2 miles north of Cloquet.	-	1970	8-13-70	7.73
04024010	Midway River at Thomson, Minn.	NE¼SE¼ sec.32, T.49 N., R.16 W., Carlton County, at bridge on county road, 0.9 mile upstream from mouth at Thomson Reservoir, and 0.2 mile north of city limits of Thomson.	a66	1968, 1970	8-13-70	6.18
04024092	Blackhoof River near Holyoke, Minn.	SW¼NW¼ sec.26, T.47 N., R.17 W., Carlton County, at bridge on County Highway 6, 3.5 miles upstream from Nemadji River, 5.6 miles northwest of Holyoke, and 11 miles northeast of Barnum.	-	1970	8-11-70	18.6
04024095	Nemadji River near Holyoke, Minn.	NE¼NE¼ sec.32, T.47 N., R.16 W., Carlton County, at bridge on State Highway 23, 3.5 miles north of Holyoke, about five miles upstream from Minnesota-Wisconsin boundary, and 7 miles south of Wrenshall.	-	1970	8-11-70	22.5
		Red River of the North basin				
05030140	Otter Tail River northwest of Luce, Minn.	NW¼ sec.19, T.137 N., R.39 W., Otter Tail County, at bridge on U.S. Highway 10, 1 mile northwest of Luce.	-	1968, 1970	12- 5-69 5-12-70 6- 3-70 8-25-70	37.6 194 187 14.6
05030181	Otter Tail River near Perham, Minn.	NW¼NE¼ sec.1, T.136 N., R.39 W., Otter Tail County, at bridge on County Highway 8, at Little Pine Lake outlet, and 2.2 miles northeast of Perham.	a383	1933, 1964-66, 1970	5-12-70 8-25-70	226 21.1
05030255	Toad River near Perham, Minn.	S½NE¼ sec.19, T.137 N., R.38 W., Otter Tail County, at bridge on County Highway 60, 5.5 miles northeast of Perham.	-	1967-68, 1970	8- 4-70 8-17-70 8-25-70	3.38 1.01 .32
05030260	Toad River above Big Pine Lake near Perham, Minn.	On line between secs.29 and 30, T.137 N., R.39 W., Otter Tail County, at bridge on County Highway 13, 0.8 mile upstream from Big Pine Lake, and 4.2 miles northeast of Perham.	a110	1964-66, 1968, 1970	12- 5-69 5-12-70 6- 3-70 8- 4-70 8-17-70	10.5 53.0 43.2 3.26 1.29
05030300	Otter Tail River near Richville, Minn.	On line between secs.7 and 8, T.135 N., R.38 W., Otter Tail County, at bridge on County Highway 14, 5 miles east of Richville.	-	1967-68, 1970	12- 4-69 5-12-70 6- 3-70 8-25-70	94.0 438 350 32.2
05030401	Otter Tail River at Otter Tail Lake outlet, near Amor, Minn.	SW¼ sec.4, T.133 N., R.40 W., Otter Tail County, at Otter Tail Lake outlet, at bridge and dam on County Highway 72, 4 miles south of Amor.	a1,160	1933, 1935-36, 1968, 1970	12- 4-69 5-13-70 6- 3-70 8-25-70	74.5 534 426 117
05040000	Pelican River near Detroit Lakes, Minn.	Lat 46°43'26", long 95°54'56", in NE¼SW¼ sec.31, T.138 N., R.41 W., at highway crossing at Buck's Mill, 200 ft downstream from concrete millpond dam on Buck Lake, and 6.5 miles southwest of city of Detroit Lakes.	123	1942-53≠, 1968-70	10- 9-69 11-12-69 1-20-70 2-25-70 8- 4-70 8-18-70 9- 1-70	.08 .05 16.6 14.0 5.40 .65 .07
05046900	Mustinka River near Elbow Lake, Minn.	Lat 45°54'10", long 96°02'25", on line between secs.11 and 14, T.128 N., R.43 W., Grant County, at culverts on County Highway 8, about 6.7 miles southwest of Elbow Lake.	a120	1964-66, 1970	5-13-70 8-26-70	.01 1.77
05047800	West Branch Mustinka River near Wheaton, Minn.	On line between secs.30 and 31, T.127 N., R.45 W., Traverse County, at bridge on County Highway 72, 0.2 mile upstream from Twelvemile Creek, and 5.9 miles southeast of Wheaton.	a200	1964-66, 1970	5-14-70 8-26-70	.37 0

≠ Operated as a continuous-record gaging station.
a Approximately.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Red River of the North basin--Continued				
05047850	Twelvemile Creek near Dumont, Minn.	On line between secs.27 and 28, T.126 N., R.45 W., Traverse County, at culvert on county road, 0.5 mile upstream from West Fork and 5.6 miles southeast of Dumont.	a115	1964-66 1970	5-14-70 8-26-70	1.26 0
05047950	Twelvemile Creek near Wheaton, Minn.	On line between secs.30 and 31, T.127 N., R.45 W., Traverse County, at bridge on County Highway 72, 0.1 mile upstream from mouth, and 6.1 miles southeast of Wheaton.	a175	1964-66, 1970	5-14-70 8-26-70	2.03 0
05049000	Mustinka River above Wheaton, Minn.	Lat 45°49'15", long 96°29'25", on line between secs.7 and 8, T.127 N., R.46 W., Traverse County, at bridge on U.S. Highway 75, 1 mile upstream from C.M.St.P.&P railroad bridge, 1.2 miles north of Wheaton, and 8 miles upstream from mouth.	834	1916, 1917, 1919-24≠, 1931-58≠, 1964-66, 1970	5-14-70	6.46
05050800	Wilkin County ditch near Campbell, Minn.	On line between secs.7 and 12, T.130 N., R.45 and 46 W., Wilkin County, at box culvert on county road, 0.1 mile south of Rabbit River, 0.2 mile upstream from mouth, and 1.1 miles southeast of Campbell.	a100	1964-66, 1970	5-13-70 8-26-70	.40 0
05050900	South Fork Rabbit River near Campbell, Minn.	On line between secs.18 and 19, T.130 N., R.45 W., Wilkin County, at bridge on graveled county road, 2 miles upstream from mouth, and 2.2 miles southeast of Campbell.	a60	1964-66, 1970	5-13-70 8-26-70	.29 0
05051000	Rabbit River near Campbell, Minn.	Lat 46°05'40", long 96°24'40", in SE¼SE¼ sec.2, T.130 N., R.46 W., Wilkin County, at bridge on County Highway 4, at Campbell, 1 mile downstream from South Fork, and 10 miles upstream from mouth.	266	1942-50≠, 1964-65, 1970	5-13-70	.72
05051520	Whiskey Creek near Kent, Minn.	On line between secs.13 and 24, T.134 N., R.48 W., Wilkin County, at double pipe-arch culvert on County Highway 20, 1.7 miles southeast of Kent.	a80	1964-66, 1970	5-13-70 8-24-70	.40 0
05051525	Wolverton Creek at Comstock, Minn.	Lat 46°39'55", long 96°44'20", on line between secs.21 and 22, T.137 N., R.48 W., Clay County, at bridge on county road, 1 mile northeast of Comstock.	a70	1964-66, 1970	5-13-70 8-24-70	.18 0
05060820	Buffalo River near Ogema, Minn.	NW¼NW¼ sec.32, T.141 N., R.42 W., Becker County, at County Highway 14, 6 miles west of Callaway, and about 9.5 miles southwest of Ogema.	-	1970	8-25-70	.86
05061080	Deerhorn Creek near Lawndale, Minn.	NW¼SW¼ sec.21, T.136 N., R.46 W., Wilkin County, at county road, 1.2 miles west of State Highway 82, 6.4 miles northwest of Lawndale, and about 6 miles southwest of Barnesville.	-	1970	8-24-70	2.91
05061100	South Branch Buffalo River near Barnesville, Minn.	Lat 46°39'29", long 96°34'57", on line between secs.23 and 26, T.137 N., R.47 W., Clay County, at County Highway 2, 7.4 miles west of Barnesville, and 4 miles south of Baker.	a185	1964-66, 1970	5-13-70 8-24-70	11.5 2.57
05061490	Stony Creek near Sabin, Minn.	On line between secs.22 and 27, T.138 N., R.47 W., Clay County, at County Highway 65, 3 miles southeast of Sabin.	a145	1964-66, 1970	5-13-70 8-24-70	22.7 0
05062335	Wild Rice River near Roy Lake, Minn.	Lat 47°23'20", long 95°38'15", in NW¼SW¼ sec.9, T.145 N., R.39 W., Mahnomen County, at bridge on County Highway 4, about 5.8 miles northwest of Roy Lake.	a270	1964-67, 1970	8-25-70	2.58

≠ Operated as a continuous-record gaging station.
a Approximately.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Red River of the North basin--Continued				
05062435	White Earth River near Mahnomen, Minn.	Lat 47°18'55", long 95°56'00", in NE¼SE¼ sec.1, T.144 N., R.42 W., Mahnomen County, at bridge on county road, 1.2 miles east of Mahnomen.	a190	1964-67, 1970	8-25-70	.02
05062440	Wild Rice River at Mahnomen, Minn.	Lat 47°18'40", long 95°57'18", in SW¼SW¼ sec.1, T.144 N., R.42 W., Mahnomen County, at bridge on County Highway 25, in southeast corner of Mahnomen, 0.5 mile east of junction of U.S. Highway 59 and County Highway 25.	a610	1964-67, 1970	8-25-70	12.8
05062465	Marsh Creek near Mahnomen, Minn.	NE¼NW¼ sec.6, T.144 N., R.42 W., Mahnomen County, at bridge on State Highway 31, about 4.2 miles west of Mahnomen.	a130	1964-67, 1970	8-25-70	.64
05062650	Wild Rice River tributary at Heiberg, Minn.	Lat 47°16'55", long 96°16'30", in SW¼ sec.16, T.144 N., R.44 W., Norman County, at footbridge in park at Heiberg, 0.2 mile upstream from mouth, and 1.5 miles northwest of Twin Valley.	a70	1964-67, 1970	8-25-70	.07
05063220	South Branch Wild Rice River near White Earth, Minn.	Lat 47°04'37", long 96°00'27", in NW¼NE¼ sec.33, T.142 N., R.42 W., Becker County, at culvert on county road, about 4 miles southwest of Ogema, and 8 miles west of White Earth.	a45	1964-67, 1970	8-25-70	0
05067900	Sandhill River near Fertile, Minn.	NE¼NE¼ sec.21, T.147 N., R.44 W., Polk County, at bridge on County Highway 12, about 1 mile northeast of Fertile.	a225	1964-67, 1970	8-25-70	4.61
05073560	Shotley Brook near Shotley, Minn.	NW¼NE¼ sec.14, T.153 N., R.31 W., Beltrami County, at County Highway 23, 2 miles upstream from mouth, and 3.2 miles northeast of Shotley.	a75	1964-67, 1970	8-26-70	.66
05073630	South Branch Battle River near Kelliher, Minn.	NE¼SE¼ sec.31, T.152 N., R.30 W., Beltrami County, at County Highway 36, 3.4 miles west of Kelliher, and about 11 miles upstream from Lower Red Lake.	a70	1964-67, 1970	8-26-70	2.88
05073790	North Branch Cormorant River near Shooks, Minn.	SW¼SW¼ sec.7, T.151 N., R.30 W., Beltrami County, at County Highway 36, 0.25 mile downstream from an unnamed tributary entering from the south, and 5.5 miles northwest of Shooks.	a50	1964-67, 1970	8-26-70	0
05073980	Sandy River near Red Lake, Minn.	Lat 47°50'40", long 95°13'40", in NW¼NE¼ sec.2, T.150 N., R.36 W., Clearwater County, at U.S. Indian Service Road, 2.5 miles upstream from mouth, and 4.2 miles southwest of village of Red Lake.	a63	1964-67, 1970	8-26-70	7.50
05075700	Mud River near Grygla, Minn.	SE¼SE¼ sec.14, T.156 N., R.40 W., Marshall County, at bridge on State Highway 89, 6 miles west of Grygla.	-	1937, 1957, 1966, 1970	8-19-70	0
05078340	Hill River at Brooks, Minn.	NE¼SW¼ sec.11, T.150 N., R.42 W., Red Lake County, at bridge on U.S. Highway 59 at Brooks.	-	1933, 1966, 1970	8-25-70	4.36
05078380	Poplar River near Brooks, Minn.	Lat 47°48'20", long 96°03'30", in NW¼NE¼ sec.20, T.150 N., R.42 W., Red Lake County, at County Highway B3, 2.5 miles upstream from mouth, and 2.8 miles west of Brooks.	a155	1950, 1964-67, 1970	8-25-70	0
05078490	Badger Creek near Red Lake Falls, Minn.	On line between sec.1, T.150 N., R.44 W., and sec.36, T.151 N., R.44 W., Red Lake County, at County Highway A4, about 1 mile upstream from mouth, and 3 miles southeast of Red Lake Falls.	-	1970	8-20-70	0
05079900	Barnums Creek at Girard, Minn.	NW¼NE¼ sec.15, T.149 N., R.47 W., Polk County, at town road, about 0.2 mile upstream from U.S. Highway 75, and 0.75 mile northeast of Girard.	a110	1964-67, 1970	8-25-70	0

a Approximately.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Red River of the North basin--Continued				
05082610	Grand Marais River near East Grand Forks, Minn.	SE¼SE¼ sec.36, T.153 N., R.50 W., Polk County, at State Highway 220, 6 miles upstream from mouth, and 6 miles north of East Grand Forks.	-	1970	8-19-70	0
		Lake of the Woods basin				
05124497	Little Isabella River near Isabella, Minn.	SE¼NW¼ sec.29, T.61 N., R.9 W., Lake County, at bridge on Forest Service Road 173, 7 miles upstream from mouth, 10 miles southwest of Forest Center Landing, and 11 miles northwest of Isabella.	-	1970	8-13-70 9-29-70	11.3 13.9
05129105	Pelican River near Orr, Minn.	NE¼NE¼ sec.10, T.65 N., R.19 W., St. Louis County, at bridge on trail, 4.5 miles northeast of Cusson, 5.7 miles northeast of Orr, and about 10 miles upstream from mouth.	-	1970	8-12-70 9-29-70	39.4 12.7
05129150	Little Indian Sioux River near Buyck, Minn.	SW¼NW¼ sec.1, T.65 N., R.15 W., St. Louis County, at bridge on County Highway 116 (Echo Trail), 1 mile upstream from Range Line Creek, and 15 miles east of Buyck.	-	1970	8-12-70 9-29-70	8.42 40.1
05129280	Ash River near Ray, Minn.	SW¼NW¼ sec.33, T.68 N., R.20 W., St. Louis County, at bridge on county road, 0.5 mile upstream from Black Duck River, 8 miles north of Ash Lake, and 14.5 miles southeast of Ray.	-	1970	8-12-70 9-30-70	2.34 17.4
05129380	Rat Root River near Littlefork, Minn.	At center of sec.1, T.68 N., R.24 W., Koochiching County, at bridge on county road, 5.7 miles south of Ericsburg, and 9 miles east of Littlefork.	-	1970	8-12-70 9-30-70	.27 30.8
05129390	East Fork Rat Root River near Ray, Minn.	On line between secs.29 and 30, T.69 N., R.22 W., Koochiching County, at bridge on County Highway 3, 2 miles north of Ray.	-	1970	8-12-70 9-30-70	.08 24.3
05129920	Little Fork River near Gheen, Minn.	NE¼NW¼ sec.16, T.62 N., R.20 W., in St. Louis County, at bridge on State Highway 1, 2.5 miles east of Meadow Brook, and 8.5 miles southwest of Gheen.	-	1970	7-30-70 8-11-70 9-29-70	31.2 13.5 15.8
05131310	Bear River near Togo, Minn.	On line between secs.29 and 32, T.62 N., R.21 W., St. Louis County, at bridge on County Highway 5, 2 miles upstream from mouth, and 4.5 miles east of Togo.	-	1970	7-30-70 8-11-70 9-29-70	20.3 22.5 18.1
05131320	Sturgeon River near Togo, Minn.	On line between secs.9 and 16, T.62 N., R.21 W., St. Louis County, at bridge on State Highway 1, 2 miles upstream from mouth, 3.8 miles west of Meadow Brook, and 6 miles northeast of Togo.	-	1970	7-30-70 8-11-70 9-29-70	82.8 62.4 64.6
05131325	Valley River near Rauch, Minn.	SE¼NE¼ sec.7, T.63 N., R.22 W., Koochiching County, at bridge on County Highway 57, 2 miles upstream from mouth, 2 miles west of Rauch, and 9.5 miles northwest of Togo.	-	1970	7-30-70 8-11-70 9-29-70	5.38 1.87 7.46
05131470	Nett Lake River near Littlefork, Minn.	SE¼SE¼ sec.8, T.66 N., R.24 W., Koochiching County, at bridge on County Highway 8, 2.2 miles upstream from mouth, and 13.2 miles southeast of Littlefork.	-	1970	10-21-69 7-29-70 8-11-70 9-29-70	249 ~~2.49~~ 86.1 12.0 33.4
05131510	Beaver Brook near Littlefork, Minn.	On line between secs.2 and 11, T.68 N., R.25 W., Koochiching County, at bridge on State Highway 217, 1.6 miles upstream from mouth, and 1.5 miles east of Littlefork.	-	1970	10-21-69 7-29-70 8-11-70 9-29-70	76.8 1.38 .47 31.0
05131600	Bowstring River near Talmoon, Minn.	On line between secs.23 and 24, T.147 N., R.25 W., Itasca County, at bridge on State Highway 6, 0.4 mile south of Bowstring, and 4.5 miles southwest of Talmoon.	-	1969-70	7-14-70 7-30-70 8-11-70 9-29-70	35.7 14.2 11.0 2.73

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Lake of the Woods basin--Continued				
05131750	Big Fork River near Bigfork, Minn.	SE¼NE¼ sec.27, T.61 N., R.27 W., Itasca County, at bridge on State Highway 6, 1 mile south of County Highway 14, and 5.5 miles west of Bigfork.	-	1970	7-14-70 7-30-70 8-11-70 9-29-70	218 122 113 138
05131760	Rice River near Bigfork, Minn.	On line between secs.16 and 21, T.60 N., R.26 W., Itasca County, at bridge on County Highway 254, 5 miles south of Bigfork.	-	1969-70	7-14-70 7-30-70 8-10-70 9-29-70	26.6 23.9 25.2 6.34
05131770	Gale Brook near Bigfork, Minn.	NE¼NW¼ sec.4, T.60 N., R.26 W., Itasca County, at culvert on County Highway 7, 1.5 miles south of Bigfork.	-	1969-70	7-14-70 7-30-70 8-11-70 9-29-70	5.60 .10 0 .17
05131870	Big Fork River near Effie, Minn.	NE¼SW¼ sec.14, T.63 N., R.27 W., Koochiching County, at bridge on State Highway 6, 0.2 mile upstream from Bowerman Brook, 1 mile south of County Highway 5, and 9.5 miles northwest of Effie.	-	1970	7-28-70 8-11-70 9-29-70	195 160 187
05131880	Bowerman Brook at Caldwell Trail, near Effie, Minn.	SW¼SW¼ sec.14, T.63 N., R.27 W., Koochiching County, at culvert on Caldwell Trail, 7.2 miles north of Effie.	-	1970	10-21-69 7-28-70 8-11-70 9-29-70	29.6 .27 .06 1.07
05131900	Caldwell Brook at Caldwell Trail, near Effie, Minn.	SW¼NW¼ sec.29, T.152 N., R.25 W., Koochiching County, at bridge on Caldwell Trail, 11.6 miles north of Effie.	-	1969-70	7-28-70 8-12-70 9-30-70	1.50 1.17 2.03
05132200	Sturgeon River near Big Falls, Minn.	NE¼SE¼ sec.26, T.155 N., R.26 W., Koochiching County, at bridge on County Highway 30, 6.2 miles northwest of Big Falls.	-	1970	10-21-69 7-28-70 8-12-70 9-30-70	490 20.2 2.88 37.9
05132400	Bear River near Littlefork, Minn.	On line between secs.4 and 9, T.69 N., R.26 W., Koochiching County, at bridge on County Highway 1, 5.5 miles west of Littlefork.	-	1969-70	7-29-70 8-12-70 9-30-70	2.76 .89 34.9
05132900	Black River near Loman, Minn.	SW¼SE¼ sec.34, T.158 N., R.25 W., in Koochiching County, 4.0 miles south by southwest of Loman on County Road 11.	-	1970	7-16-70 8-12-70 9-30-70	56.8 .16 13.1
05133200	West Branch Black River near Loman Minn.	SE¼SW¼ sec.3, T.158 N., R.25 W., Koochiching County, at bridge on County Highway 82, 1.6 miles northwest of Loman.	a288	1969-70	7-14-70 7-16-70 8-12-70 9-30-70	59.1 37.8 0 5.61
05134100	North Branch Rapid River near Baudette, Minn.	NW¼SW¼ sec.4, T.158 N., R.31 W., Lake of the Woods County, at bridge on County Highway 1, 12.7 miles southwest of Baudette.	-	1969-70	7-15-70 8-13-70	75.9 .95
05135000	East Fork Rapid River near Clementson, Minn.	NE¼NE¼ sec.19, T.160 N., R.29 W., Koochiching County, at Eidems Rapids, 1.5 miles upstream from junction with Rapid River, and 2.0 miles southeast of Clementson.	-	1970	7-15-70 8-13-70 9-30-70	30.5 .97 3.09
05135100	Rapid River at Clementson, Minn.	NE¼SE¼ sec.12, T.160 N., R.30 W., Lake of the Woods County, at bridge on State Highway 11 at Clementson.	-	1969-70	7-14-70 8-13-70	258 17.6
05136000	Baudette River at Baudette, Minn.	On line between secs.22 and 27, T.160 N., R.31 W., Lake of the Woods County, at bridge on county road, 4 miles southwest of Baudette.	-	1969-70	7-15-70 8-13-70	2.18 0
05137000	Winter Road River near Baudette, Minn.	SE¼SE¼ sec.36, T.161 N., R.32 W., Lake of the Woods County, at bridge on old State Highway 11, 4.5 miles west of Baudette.	-	1969-70	7-15-70 8-13-70	17.5 .67
05138000	County ditch No. 1 near Williams, Minn.	NE¼NE¼ sec.24, T.162 N., R.34 W., Lake of the Woods County, at triple box culvert on County Highway 2, 5.2 miles north of Williams.	-	1969-70	7-15-70 8-13-70	2.14 .58

a Approximately.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Mississippi River main stem				
05200010	Mississippi River at Outlet of Lake Itasca, at Lake Itasca, Minn.	NW¼SW¼ sec.35, T.144 N., R.36 W., Clearwater County, at first culvert on County Highway 38, downstream from Lake Itasca, in Itasca State Park, 1 mile south of town of Lake Itasca, and about 21.5 miles southwest of Bemidji.	a80	1964-65, 1967, 1970	8- 6-70	1.98
05200445	Mississippi River at Bemidji, Minn.	NW¼NW¼ sec.20, T.146 N., R.33 W., Beltrami County, at bridge on County Highway 11, about 1.5 miles southwest of intersection of U.S. Highway 2 and County Highway 7 in Bemidji, and about 2 miles upstream from Lake Irving.	a400	1950, 1964-65, 1970	8- 6-70	50.6
		Schoolcraft River basin				
05200450	Schoolcraft River near Bemidji, Minn.	SW¼SE¼ sec.31, T.146 N., R.33 W., Beltrami County, at culvert on County Highway 2, 0.1 mile downstream from outlet of Plantaganette Lake, and 4.6 miles south of Bemidji, Minn.	a165	1947, 1964-65, 1970	8- 6-70	19.8
		Turtle River basin				
05200850	Turtle River near Pennington, Minn.	SE¼ sec.15, T.147 N., R.31 W., Beltrami County, at bridge on County Highway 20, 7 miles northwest of Pennington.	a165	1950, 1964-65, 1970	8- 6-70	38.1
05200920	North Turtle River near Pennington, Minn.	NW¼NE¼ sec.24, T.147 N., R.31 W., Beltrami County, at bridge on County Highway 20, 0.5 mile upstream from mouth, and 5.8 miles northwest of Pennington.	a70	1950, 1964-65, 1970	8- 6-70	4.26
		Leech Lake River basin				
05204400	Boy River at Longville, Minn.	NW¼SE¼ sec.34, T.141 N., R.28 W., Cass County, at bridge on State Highway 84, at outlet of Girl Lake at Longville.	a160	1953-54, 1964-65, 1970	8- 5-70	21.2
05205200	Boy River near Remer, Minn.	S½SE¼ sec.28, T.142 N., R.27 W., Cass County, at bridge on County Highway 53, about 1.5 miles upstream from Boy Lake, and about 9 miles northwest of Remer.	a310	1964-65, 1970	8- 5-70	42.0
		Prairie River basin				
05212200	Prairie River near Nashwauk, Minn.	W½ sec.19, T.58 N., R.23 W., Itasca County, at bridge on County Highway 336, about 10 miles northwest of Nashwauk.	a220	1964-65, 1970	8-11-70	16.0
		Willow River basin				
05220670	Willow River near Hill City, Minn.	On line between secs.14 and 15, T.151 N., R.26 W., Aitkin County, at bridge on U.S. Highway 169, 6 miles south of junction of State Highway 34 and U.S. Highway 169, at south edge of Hill City	a160	1964-65, 1970	8-10-70	13.5
05221020	Willow River below Palisade, Minn.	NW¼NE¼ sec.30, T.49 N., R.25 W., Aitkin County, at bridge on County Highway 3, 3.2 miles west of Palisade.	a442	1946-48, 1953-54, 1957, 1964-65, 1970	8-10-70	29.0
		Rice River basin				
05222200	Rice River at Hassman, Minn.	E½SE¼ sec.34, T.48 N., R.26 W., Aitkin County, at bridge on U.S. Highway 169, about 0.5 mile south of junction of Highways 169 and 210, at Hassman.	a284	1936, 1944-51, 1953-54, 1957, 1964-65, 1970	8-10-70	4.22
		Ripple River basin				
05227480	Ripple River at Aitkin, Minn.	NE¼NE¼ sec.26, T.47 N., R.27 W., Aitkin County, at bridge on U.S. Highway 169, 0.2 mile south of intersection with U.S. Highway 210 in Aitkin, and about 0.8 mile upstream from mouth.	a125	1964-65, 1970	8- 5-70	6.95

a Approximately.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Pine River basin				
05229500	Pine River near Jenkins, Minn.	NE¼SE¼ sec.11, T.137 N., R.29 W., Crow Wing County, at bridge on County Highway 15, 0.8 mile upstream from upper Whitefish Lake, and 3.5 miles northeast of Jenkins.	a285	1964-65, 1970	8- 5-70	60.5
05235500	Little Pine River near Cross Lake, Minn.	SW¼SW¼ sec.33, T.137 N., R.26 W., Crow Wing County, at bridge on county road, 5 miles upstream from mouth, 6.5 miles southeast of the town of Cross Lake, and about 11 miles north of Crosby.	a195	1964-65, 1970	8- 5-70	8.00
		Crow Wing River basin				
05242960	Crow Wing River near Hubbard, Minn.	NE¼NE¼ sec.20, T.139 N., R.33 W., Hubbard County, at bridge on State Highway 87, at outlet of Third Crow Wing Lake, 6.6 miles east of Hubbard.	-	1930-31, 1964-66, 1970	8-26-70	74.4
05243330	Straight River near Park Rapids, Minn.	NW¼NE¼ sec.11, T.139 N., R.35 W., Hubbard County, at bridge on U.S. Highway 71, 3.2 miles south of Park Rapids, and 3.7 miles northwest of Hubbard.	-	1970	8-26-70	46.5
05243730	Straight River near Hubbard, Minn.	NW¼NE¼ sec.18, T.139 N., R.34 W., Hubbard County, at bridge on State Highway 87, 0.5 mile downstream from Fishhook River, 2 miles northwest of Hubbard, and 4.4 miles southeast of Park Rapids.	-	1964-66, 1970	8-26-70	77.6
05243740	Long Lake outlet at Hubbard, Minn.	SW¼NW¼ sec.20, T.139 N., R.34 W., Hubbard County, at bridge on State Highway 87 in Hubbard.	-	1964-66, 1970	8-26-70	14.2
05243750	Shell River near Hubbard, Minn.	SW¼NW¼ sec.30, T.139 N., R.34 W., Hubbard County, at bridge on county road, just downstream from Straight River, and 1.2 miles southwest of Hubbard.	-	1964-66, 1970	8-26-70	121
05244340	Leaf River near Bluffton, Minn.	SW¼NW¼ sec.6, T.134 N., R.36 W., Otter Tail County, at bridge on County Highway 143, 2.2 miles southwest of Bluffton, and 4.6 miles northeast of Deer Creek.	-	1970	8-26-70	8.07
05244350	Leaf River near Wadena, Minn.	NW¼ sec.36, T.135 N., R.36 W., Otter Tail County, at bridge on County Highway 75, 2 miles northwest of Wadena.	-	1967, 1970	12- 9-69 5-22-70 6- 4-70	35.6 140 182
05244355	Leaf River tributary near Wadena, Minn.	NW¼NW¼ sec.34, T.135 N., R.35 W., Wadena County, at bridge on county road, 0.1 mile east of U.S. Highway 71, and 3 miles northeast of Wadena.	-	1968, 1970	12- 9-69 5-22-70 6- 4-70	6.97 16.1 13.0
05244360	Leaf River near Verndale, Minn.	Lat 46°29'23", long 94°53'00", on line between secs.19 and 20, T.135 N., R.34 W., Wadena County, at bridge on County Highway 22, 6.4 miles north of Verndale.	-	1964-66, 1968-70	5-21-70 7- 6-70 8-25-70	219 69.6 19.4
05244370	Wing River near Hewitt, Minn.	Lat 46°21'16", long 95°05'35", on line between secs.3 and 4, T.133 N., R.35 W., Todd County, at bridge on county road, 2 miles north of Hewitt.	-	1967-70	12- 8-69 5-22-70 6- 4-70 8-25-70	17.4 39.8 43.0 .68
05244380	Wing River near Verndale, Minn.	SE¼NW¼ sec.26, T.134 N., R.35 W., Wadena County, at County Highway 1, 2.5 miles west of Verndale.	-	1967-70	5-21-70 7- 6-70 8-25-70	46.1 17.1 2.85
05244390	Wing River at Verndale, Minn.	SW¼NW¼ sec.19, T.134 N., R.34 W., Wadena County, at bridge on County Highway 111, 1 mile northwest of Verndale.	-	1967-70	5-21-70 7- 6-70 8-25-70	49.6 23.8 6.83
05244400	Wing River below Verndale, Minn.	Lat 46°26'28", long 95°00'02", on line between secs.5 and 8, T.134 N., R.34 W., Wadena County, at bridge on County Highway 4, 3.1 miles north of Verndale.	-	1964-70	12- 9-69 5-21-70 6- 4-70 7- 6-70 8-25-70	29.9 57.3 60.3 22.6 9.39
05244403	Wing River near Wadena, Minn.	SE¼SE¼ sec.29, T.135 N., R.35 W., Wadena County, at bridge on county road, 1 mile upstream from mouth, 5 miles north of Verndale, and 7 miles northeast of Wadena.	-	1967-70	7- 6-70 8-25-70	27.2 11.3

a Approximately.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Crow Wing River basin--Continued				
05244410	Redeye River at Sebeka, Minn.	NE¼NE¼ sec.4, T.136 N., R.35 W., Wadena County, at bridge on U.S. Highway 71 in Sebeka.	-	1968-70	10-27-69 8-26-70	28.2 1.91
05244420	Redeye River near Aldrich, Minn.	Lat 46°29'55", long 94°54'30", on line between secs.13 and 24, T.135 N., R.34 W., Wadena County, at County Highway 7, 1.5 miles upstream from mouth, 3.5 miles north of Central, and 8.5 miles north of Aldrich.	-	1964-66, 1968-70	12-10-69 5-21-70 6- 4-70 7- 7-70 8-25-70	29.2 109 121 32.3 8.42
05244440	Leaf River near Aldrich, Minn.	SW¼SW¼ sec.34, T.135 N., R.33 W., Wadena County, at bridge on County Highway 29, 7 miles northeast of Aldrich.	-	1965, 1968-70	12-10-69 5-21-70 6- 4-70	132 429 509
05244460	Partridge River at Aldrich, Minn.	SW¼ sec.35, T.134 N., R.34 W., Wadena County, at bridge on U.S. Highway 10, in Aldrich.	-	1967, 1968, 1970	12- 9-69 5-22-70 6- 4-70 7- 7-70	3.68 12.8 13.2 3.68
05244470	Partridge River near Aldrich, Minn.	Lat 46°24'58", long 94°50'24", in NW¼SW¼ sec.15, T.134 N., R.33 W., Wadena County, on County Highway 29, about 0.8 mile upstream from mouth, and 5.5 miles northeast of Aldrich.	-	1964-66, 1969-70	12- 9-69 5-21-70 6- 4-70 7- 7-70 8-25-70	10.4 21.0 18.6 9.41 2.63
05244540	Mosquito Creek at Motley, Minn.	E½SW¼ sec.7, T.133 N., R.31 W., Cass County, at U.S. Highway 210, and about 0.2 miles upstream from mouth, at Motley.	-	1964-66, 1970	5-21-70 8-26-70	21.7 2.37
05245200	Eagle Creek at Browerville, Minn.	SE¼SW¼ sec.5, T.130 N., R.33 W., Todd County, at bridge on County Highway 21, in Browerville, and 0.5 mile upstream from mouth.	-	1970	8-25-70	1.50
		Nokasippi River basin				
05261520	Nokasippi River near Fort Ripley, Minn.	Lat 46°12'02", long 94°19'03", on line between secs.13 and 24, T.43 N., R.32 W., Crow Wing County, at bridge on County Highway 2, 3 miles northeast of Fort Ripley.	-	1968-70	10-23-69	26.5
		Elk River basin				
05263000	Elk River near Little Falls, Minn.	Lat 46°01'13", long 94°22'38", in NW¼NE¼ sec.6, T.129 N., R.29 W., Morrison County, at bridge on County Highway 13, 1 mile upstream from mouth, and 3 miles north of Little Falls.	a135	1968-70	10-23-69	8.35
		Swan River basin				
05265700	Swan River near Little Falls, Minn.	Lat 45°56'00", long 94°34'50", in NW¼NW¼ sec.1, T.128 N., R.30 W., Morrison County, at bridge on State Highway 238, 1.5 miles upstream from mouth, and 3 miles southwest of Little Falls.	-	1968-70	10-23-69	17.4
		Spunk Creek basin				
05267580	Spunk Creek near Royalton, Minn.	Lat 45°47'04", long 94°18'54", in SE¼NW¼ sec.27, T.127 N., R.29 W., Morrison County, at bridge on County Highway 21, about 1.5 miles upstream from mouth, and 3.5 miles southwest of Royalton.	-	1968-70	10-23-69	3.88
		Sauk River basin				
05270130	Ashley Creek at Westport, Minn.	On line between secs.14 and 15, T.126 N R.36 W., Pope County, at bridge on county road, 0.7 mile northwest of Westport.	-	1970	12- 8-69 6- 9-70	8.85 10.2
05270150	Ashley Creek near Sauk Centre, Minn.	Lat 45°46'46", long 94°58'52", in NW¼SE¼ sec.29, T.127 N., R.34 W., Todd County at bridge on County Highway 11, 3 miles north of Sauk Centre.	-	1968-70	10-23-69	16.8

a Approximately.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Sauk River basin--Continued				
05270230	Sauk River at New Munich, Minn.	Lat 45°37'32", long 94°45'39", in NE¼NW¼ sec.19, T.125 N., R.32 W., Stearns County, at bridge on County Highway 30, 1 mile southwest of New Munich.	-	1968-70	10-23-69	43.8
		Silver Creek basin				
05273600	Silver Creek near Hasty, Minn.	Lat 45°22'37", long 93°56'31", in SE¼NW¼ sec.15, T.122 N., R.26 W., Wright County, at county road, 1.6 miles northeast of Hasty.	-	1969-70	5-19-70	7.90
		Elk River basin				
05273990	Mayhew Creek near St. Cloud, Minn.	NE¼NW¼ sec.26, T.36 N., R.30 W., Benton County, 300 feet upstream from mouth, 500 feet northwest of Elk River bridge on State Highway 95, and 6 miles east of St. Cloud.	-	1968-70	10-22-69	.46
05274000	Elk River near St. Cloud, Minn.	Lat 45°35'14", long 94°02'25", in NE¼NW¼ sec.26, T.36 N., R.30 W., Benton County, at bridge on State Highway 95, 6 miles east of St. Cloud.	-	1968-70	10-22-69	6.20
05274300	Rice Creek near Clear Lake, Minn.	At center of N½ sec.29, T.35 N., R.29 W., Sherburne County, at County Highway 61, 3.8 miles northeast of Clear Lake.	-	1969-70	5-19-70	13.0
05274480	Snake River near Big Lake, Minn.	SW¼SW¼ sec.36, T.34 N., R.28 W., Sherburne County, at culvert on County Highway 73, 4.1 miles northwest of Big Lake.	-	1969-70	5-19-70	21.5
		Crow River basin				
05275970	North Fork Crow River near Georgeville, Minn.	Lat 45°29'07", long 94°55'37", in SE¼SE¼ sec.3, T.123 N., R.34 W., Stearns County, at bridge on County Highway 32, 2 miles east of U.S. Highway 71, and 4 miles north of Georgeville.	-	1970	12- 3-69 6- 9-70	10.7 25.8
05276000	North Fork Crow River near Regal, Minn.	Lat 45°22'45", long 94°47'40", in S½ sec.11, T.122 N., R.33 W., Kandiyohi County, at bridge on county road, 3 miles southeast of Regal.	215	1943-54≠, 1955, 1969-70	12- 3-69 6- 9-70	11.3 32.2
05277050	Grove Creek near Manannah, Minn.	Lat 45°14'23", long 94°36'26", on line between sec.6, T.120 N., R.31 W., and sec.32, T.121 N., R.31 W., Meeker County, at County Highway 46, 1.1 miles southeast of Manannah, and 8.5 miles northwest of Litchfield.	-	1969-70	10-23-69 11-25-69 4-27-70 6-30-70 8- 6-70	1.15 1.68 8.62 2.27 1.03
05278340	North Fork Crow River near Delano, Minn.	Lat 45°05'22", long 93°52'07", on line between secs.29 and 30, T.119 N., R.25 W., Wright County, at State Highway 25, 5 miles upstream from mouth, and 5 miles northwest of Delano.	-	1969-70	10-23-69 11-25-69 4-28-70 5-20-70 7- 1-70 8- 5-70 9- 8-70	48.2 54.5 753 392 472 138 52.4
05278830	Buffalo Creek near Buffalo Lake, Minn.	Lat 44°46'05", long 94°32'55", in center of sec.15, T.115 N., R.31 W., Renville County, at bridge on County Highway 25, just upstream from tributary entering on right bank, 2 miles northwest of Stewart, and 2 miles northeast of the town of Buffalo Lake.	-	1969-70	10-23-69 4-30-70 6-30-70 8- 6-70 9- 9-70	1.01 24.4 26.3 2.80 3.00
05278835	Buffalo Creek tributary No. 2 near Buffalo Lake, Minn.	Lat 44°46'05", long 94°32'55", in center of sec.15, T.115 N., R.31 W., Renville County, at mouth, just downstream from bridge over Buffalo Creek on County Highway 25, 2 miles northwest of Stewart, and 2 miles northeast of the town of Buffalo Lake.	-	1969-70	10-23-69 4-30-70 6-30-70 8- 6-70 9- 9-70	1.19 13.7 11.5 1.46 2.10

≠ Operated as a continuous-record gaging station.

Discharge measurements made at low-flow partial record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Crow River basin--Continued				
05278950	Buffalo Creek near Plato, Minn.	Lat 44°48'03", long 94°02'24", at center of N½ sec.2, T.115 N., R.27 W., McLeod County, at bridge on County Highway 9, 2 miles north of Plato, 5 miles upstream from mouth, and 6 miles northeast of Glencoe.	-	1969-70	10-22-69 4-30-70 5-20-70 7- 1-70 8- 7-70 9-10-70	.62 141 33.9 102 2.60 12.6
		Rum River basin				
05284500	Rum River at Onamia, Minn.	On line between secs.5 and 6, T.41 N., R.26 W., Mille Lacs County, at bridge on U.S. Highway 169, 0.1 mile upstream from Black Brook, 0.8 mile south of Onamia, and 1.4 miles downstream from Lake Onamia.	a414	1910-13≠, 1946-47, 1952-53, 1968-70	10-22-69 5-20-70 8-27-70	70.2 240 79.6
05284660	Rum River near Milaca, Minn.	On line between secs.23 and 24, T.38 N., R.27 W., Mille Lacs County, at bridge on County Highway 9, 1.8 miles north of Milaca.	-	1968-70	10-22-69 8-27-70	78.7 90.7
05284710	West Branch Rum River at Princeton, Minn.	Lat 45°34'24", long 93°34'47", in NE¼ sec.33, T.36 N., R.26 W., Mille Lacs County, at bridge on U.S. Highway 169, 400 ft upstream from mouth, in Princeton.	-	1961, 1965, 1968-70	10-22-69	11.3
05284950	Stanchfield Creek at Springvale, Minn.	Lat 45°36'59", long 93°18'06", on line between secs.11 and 14, T.36 N., R.24 W., Isanti County, at bridge on County Highway 32, 1.5 miles upstream from mouth, 1 mile south of Springvale, and 3 miles northeast of Walba.	-	1965, 1968-70	10-22-69 5-21-70	9.38 22.4
05284970	Lower Stanchfield Creek near Grandy, Minn.	On line between secs.5 and 8, T.36 N., R.23 W., Isanti County, at bridge on County Highway 6, at Little Stanchfield Lake outlet, and 1.9 miles southwest of Grandy.	-	1969-70	5-21-70	10.2
05285800	Seeley Creek near St. Francis, Minn.	Lat 45°21'58", long 93°22'20", in SW¼NE¼ sec.7, T.33 N., R.24 W., Anoka County, at bridge on County Highway 55, 1.6 miles south of St. Francis.	-	1965, 1969-70	5-21-70	7.24
05286300	Cedar Creek near Anoka, Minn.	Lat 45°15'57", long 93°21'59", in SW¼SW¼ sec.32, T.33 N., R.24 W., Anoka County, at bridge on county road, 0.5 mile upstream from mouth, 4.3 miles southwest of Cedar, and 7 miles north of Anoka.	-	1965, 1968-70	10-22-69 5-21-70	24.7 19.6
05286800	Trott Brook near Nowthen, Minn.	Lat 45°17'16", long 93°25'08", in NW¼SE¼ sec.2, T.32 N., R.25 W., Anoka County, at State Highway 47, 0.8 mile upstream from mouth, and 3.9 miles southeast of Nowthen.	-	1965, 1969-70	5-21-70	11.9
		Minnesota River basin				
05292400	Stony Run at Odessa, Minn.	NE¼NE¼ sec.30, T.121 N., R.45 W., Big Stone County, at culvert on U.S. Highway 75, 1 mile upstream from mouth, and 0.8 mile northwest of Odessa.	a45	1963-64, 1970	5-19-70	3.99
05292900	South Fork Yellow Bank River near Bellingham, Minn.	SE¼NE¼ sec.25, T.120 N., R.46 W., Lac qui Parle County, at bridge on county road, 0.7 mile upstream from confluence with North Fork, and 4.4 miles northwest of Bellingham.	-	1963-64, 1970	5-19-70	20.4
05293003	Lac qui Parle County ditch No. 13 near Bellingham, Minn.	Near center of sec.24, T.120 N., R.45 W., Lac qui Parle County, at bridge 3 miles upstream from mouth, and 4 miles northwest of Bellingham.	-	1963-64, 1970	5-19-70	2.54
05293006	Five Mile Creek near Correll, Minn.	NE¼NW¼ sec.12, T.120 N., R.44 W., Big Stone County, at culvert on State Highway 7, 2.25 miles east of Correll, and 3.5 miles upstream from mouth.	-	1963-64, 1970	5-19-70	3.39

≠ Operated as a continuous-record gaging station.
a Approximately.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Minnesota River basin--Continued				
05293370	Pomme de Terre River near Elbow Lake, Minn.	NE¼SE¼ sec.13, T.129 N., R.42 W., Grant County, at highway bridge 1 mile downstream from Pomme de Terre Lake, and 4 miles east of Elbow Lake.	a334	1963-65, 1970	8-25-70	.13
05293600	Mud Creek near Morris, Minn.	On line between secs.22 and 23, T.124 N., R.42 W., Stevens County, at concrete culvert on U.S. Highway 59, 1 mile upstream from mouth, and 3 miles south of Morris.	a137	1963-65, 1970	8-26-70	.11
05294500	Emily Creek near Louisborg, Minn.	NE¼NE¼ sec.26, T.119 N., R.43 W., Lac qui Parle County, at twin culverts on county road, 1 mile upstream from mouth, and 9.7 miles southeast of Louisborg.	-	1963-64, 1970	5-20-70	1.97
05298500	Lac qui Parle River near Canby, Minn.	On line between secs.3 and 10, T.115 N., R.44 W., Yellow Medicine County, at bridge on State Highway 87, 0.5 mile upstream from Lazarus Creek, and 8 miles northeast of Canby.	a180	1963-66, 1969-70	5-21-70	18.2
05299600	Lazarus Creek near Canby, Minn.	SE¼SE¼ sec.30, T.116 N., R.44 W., Lac qui Parle County, at bridge on U.S. Highway 75, 8.5 miles northeast of Canby.	a120	1964-66b, 1970	5-21-70	14.5
05299800	West Branch Lac qui Parle River at Dawson, Minn.	S½NE¼ sec.21, T.117 N., R.43 W., Lac qui Parle County, at dam 400 ft downstream from railroad and highway bridge in Dawson.	a485	1963-66, 1968-70	5-21-70	38.5
05301950	Chippewa River near Cyrus, Minn.	On line between secs.17 and 18, T.125 N., R.40 W., Pope County, at bridge on County Highway 3, 1.25 miles north of Cyrus.	a400	1963-66, ~~1970~~ 1969-70	8-26-70	0
05302700	Little Chippewa River near Cyrus, Minn.	On line between secs.34 and 35, T.125 N., R.40 W., Pope County, at bridge on County Highway 73, 3.2 miles southeast of Cyrus.	-	1969-70	8-26-70	.03
05302980	Emily Lake outlet near Hancock, Minn.	S½S½ sec.28, T.124 N., R.40 W., Pope County, at bridge on county road, 5 miles east of Hancock.	-	1969-70	8-26-70	2.63
05303280	East Branch Chippewa River at Terrace, Minn.	SW¼NE¼ sec.33, T.124 N., R.37 W., Pope County, at bridge on State Highway 104, at west edge of Terrace.	-	1970	12- 5-69 6- 9-70 8-26-70	11.5 27.5 3.01
05303350	East Branch Chippewa River near Swift Falls, Minn.	W½ sec.14, T.122 N., R.38 W., Swift County, at bridge on County Highway 28, 1.7 miles southeast of Swift Falls.	-	1969-70	8-26-70	5.99
05303400	Mud Creek near Swift Falls, Minn.	W½NW¼ sec.19, T.122 N., R.37 W., Swift County, at bridge on County Highway 87, 3.4 miles southeast of Swift Falls.	-	1969-70	8-26-70	1.87
05303430	Mud Creek near Benson, Minn.	On line between secs.2 and 3, T.121 N., R.39 W., Swift County, at bridge on county road, 2.9 miles east of Benson.	-	1969-70	8-26-70	1.92
05303470	East Branch Chippewa River near Benson, Minn.	SE¼NW¼ sec.29, T.122 N., R.39 W., Swift County, at bridge on county road, 2.2 miles north of Benson.	a520	1964-66, 1969-70	8-26-70	7.48
05304000	Shakopee Creek near Benson, Minn.	On line between sec.13, T.120 N., R.40 W., and sec.18, T.120 N., R.39 W., Swift County, at bridge on county road, 7.8 miles south of Benson.	a352	1949-54≠, 1957, 1969-70	8-26-70	1.84
05304800	Dry Weather Creek near Montevideo, Minn.	N½ sec.11, T.118 N., R.41 W., Chippewa County, at bridge on county road, 7.4 miles northwest of Montevideo.	-	1969-70	5-20-70 8-27-70	5.44 .33

≠ Operated as a continuous-record gaging station.
a Approximately.
b Published as Canby Creek.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Minnesota River basin--Continued				
*05305200	Spring Creek near Montevideo, Minn.	Lat 44°58'40", long 95°43'00", in SW¼SW¼ sec.32, T.118 N., R.40 W., Chippewa County, at box culvert on State Highway 29, 1.25 miles upstream from mouth, and 2.2 miles north of Montevideo.	16.3	1960-70	5-20-70 8-27-70	2.07 .44
05311100	Palmer Creek near Granite Falls, Minn.	SW¼SW¼ sec.16, T.116 N., R.39 W., Chippewa County, at bridge on county road, 2.5 miles north of Granite Falls.	-	1969-70	5-21-70	3.41
05314520	Spring Creek near Maynard, Minn.	SW¼NW¼ sec.16, T.116 N., R.38 W., Renville County, at culvert on farm road, 75 ft upstream from mouth, and 3.5 miles southeast of Maynard.	-	1969-70	5-22-70	7.21
05314530	Hawk Creek near Granite Falls, Minn.	Lat 44°49'59", long 95°26'01", in SE¼SW¼ sec.21, T.116 N., R.38 W., Renville County, at bridge on county road, 1.5 miles downstream from Spring Creek, and about 5 miles northeast of Granite Falls.	a486	1968-70	5-27-70	24.4
05316970	Cottonwood River at Leavenworth, Minn.	On line between secs.21 and 22, T.109 N., R.33 W., Brown County, at bridge on County Highway 8, 0.25 miles north of Leavenworth.	a850	1966-70	6-24-70	270
05316990	Sleepy Eye Creek near Cobden, Minn.	On line between secs.8 and 9, T.109 N., R.33 W., Brown County, at bridge on county highway, 1.75 miles southeast of Cobden.	a290	1966-70	6-24-70	28.2
05317200	Little Cottonwood River near Cambria, Minn.	Near center of sec.17, T.109 N., R.29 W., Blue Earth County, at bridge on State Highway 68, 1.5 miles south of Courtland, and 1.5 miles west of Cambria.	a230	1965-70	6-24-70	84.7
05317300	Morgan Creek at Cambria, Minn.	S½SW¼ sec.16, T.109 N., R.29 W., Blue Earth County, at culvert on State Highway 68, 0.5 mile upstream from mouth, and 0.6 mile northwest of Cambria.	-	1969-70	6-24-70	5.24
05317400	Swan Lake Outlet near Nicollet, Minn.	SE¼SE¼ sec.28, T.109 N., R.28 W., Nicollet County, at culvert on County Highway 62, 0.8 mile upstream from mouth, and 4.5 miles south of Nicollet.	-	1966-70	5-21-70	12.0
05317818	Blue Earth River near Blue Earth, Minn.	Lat 43°34'22", long 94°06'08", on line between secs.5 and 8, T.101 N., R.27 W., Faribault County, at bridge on County Highway 4, 4.8 miles south of Blue Earth.	a310	1968-70	10-10-69	12.7
05318140	South Creek near Winnebago, Minn.	Lat 43°42'33", long 94°10'38", in center of sec.22, T.103 N., R.28 W., Faribault County, at bridge on County Highway 5, 3.5 miles south of Winnebago.	-	1970	6-11-70	44.2
05318180	Center Creek near Huntley, Minn.	Lat 43°43'50", long 94°12'26", on line between secs.16 and 17, T.103 N., R.28 W., Faribault County, at bridge on county road, 1.5 miles east of Huntley, and 2 miles upstream from mouth.	a130	1968-70	10-10-69 6-11-70	6.60 64.8
05318250	Elm Creek near Winnebago, Minn.	Lat 43°45'02", long 94°12'32", in NE¼SE¼ sec.5, T.103 N., R.28 W., Faribault County, at bridge on county road, 0.7 mile upstream from mouth, and 2.5 miles southwest of Winnebago.	a260	1968-70	10-10-69	2.22
05318700	Watonwan River at La Salle, Minn.	Lat 44°03'53", long 94°35'22", on line between secs.19 and 20, T.107 N., R.31 W., Watonwan County, at bridge on County Highway 14, 1 mile southwest of La Salle.	a210	1968-70	10- 7-69	3.96

* Also a crest-stage partial-record station.
a Approximately.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Minnesota River basin--Continued				
05318800	St. James Creek near La Salle, Minn.	Lat 44°03'04", long 94°33'26", on line between secs.21 and 28, T.107 N., R.30 W., Watonwan County, at bridge on county road, 100 ft downstream from Butterfield Creek, and 1.4 miles southeast of La Salle.	a115	1968-70	10- 7-69	4.04
05319100	South Fork Watonwan River near Madelia, Minn.	Lat 44°02'33", long 94°27'42", NE¼SW¼ sec.29, T.107 N., R.30 W., Watonwan County, at bridge on County Highway 116, 0.4 mile upstream from mouth, and 2.2 miles west of Madelia.	a185	1968-70	10- 9-69	1.86
05319490	Watonwan River near Garden City, Minn.	SE¼SE¼ sec.31, T.107 N., R.28 W., Blue Earth County, at bridge on County Highway 20, 0.5 mile upstream from right bank tributary, and 3.7 miles southwest of Garden City.	a800	1968-70	10- 8-69	24.1
05320070	Le Sueur River at Wilton, Minn.	Lat 44°00'52", long 93°31'38", in NE¼SE¼ sec.1, T.106 N., R.23 W., Waseca County, at bridge on County Highway 4, 0.2 mile east of Wilton.	a155	1968-70	10-15-69	5.92
05320330	Cobb River near Good Thunder, Minn.	Lat 44°02'50", long 94°00'00", in SE¼NW¼ sec.30, T.107 N., R.26 W., Blue Earth County, at bridge on County Highway 16, 4.5 miles northeast of Good Thunder.	a305	1968-70	10- 8-69	.24
05320480	Maple River near Rapidan, Minn.	Lat 44°03'54", long 94°01'32", on line between secs.13 and 24, T.107 N., R.27 W., Blue Earth County, at bridge on County Highway 35, 3 miles southeast of Rapidan.	-	1968-70	10- 8-69	6.74
05326400	Rush River near Henderson, Minn.	NW¼NW¼ sec.24, T.112 N., R.26 W., Sibley County, at bridge on State Highway 93, 0.4 mile upstream from mouth, and 2 miles south of Henderson.	a397	1970	5-20-70	32.8
05327000	High Island Creek near Henderson, Minn.	NE¼NW¼ sec.26, T.113 N., R.26 W., Sibley County, at bridge on County Highway 6, 1.6 miles upstream from mouth, and 3.1 miles north of Henderson.	-	1970	5-20-70	12.0
05329900	Bevens Creek at East Union, Minn.	SW¼NW¼ sec.2, T.114 N., R.24 W., Carver County, at bridge on County Highway 40, 1.3 miles upstream from mouth, and 0.4 mile south of East Union.	-	1970	5-20-70	5.83
05330700	Chaska Creek at Chaska, Minn.	NE¼NE¼ sec.8, T.115 N., R.23 W., Carver County, at bridge on U.S. Highway 212 in Chaska, and 1 mile upstream from mouth.	-	1967-70	5-20-70	1.61
		St. Croix River basin				
05335110	Lower Tamarack River near Duxbury, Minn.	On line between secs.21 and 28, T.42 N., R.17 W., Pine County, at bridge on County Highway 25, 2 miles south of Duxbury.	-	1967, 1970	5-18-70	41.6
05335130	McDermott Creek near Duxbury, Minn.	On line between secs.22 and 27, T.42 N., R.17 W., Pine County, at bridge on County Highway 25, 2.5 miles southeast of Duxbury.	-	1967, 1970	5-18-70	42.5
05335150	Hay Creek near Markville, Minn.	SE¼ sec.30, T.42 N., R.16 W., Pine County, at bridge on County Highway 25, 4 miles west of Markville.	-	1967, 1970	5-19-70	38.4
05335151	Lower Tamarack River near ~~Duxbury~~ Markville, Minn.	SE¼NW¼ sec.32, T.42 N., R.16 W., Pine County, at bridge on county highway, 3 miles southeast of Markville.	-	1967, 1970	5-18-70	136
05335170	Crooked Creek near Hinckley, Minn.	Lat 46°01'41", long 92°~~03~~ 31'46", in NE¼NE¼ sec.30, T.41 N., R.17 W., Pine County, at bridge on State Highway 48, 2.8 miles upstream from mouth, 8 miles south of Duxbury, and 19 miles east of Hinckley.	-	1966-70	5-18-70	52.1

a Approximately.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		St. Croix River basin--Continued				
05335890	Little Sand Creek near Hinckley, Minn.	SE¼ sec.31, T.41 N., R.18 W., Pine County, at bridge on county highway, 14 miles southeast of Hinckley.	-	1967, 1970	5-18-70	12.8
05335900	Sand Creek near Hinckley, Minn.	Lat 45°57'05", long 92°~~50'25"~~ 40'02", in NW¼SW¼ sec.13, T.40 N., R.18 W., Pine County, at bridge on St. Croix State Park Road, 2.5 miles upstream from mouth, 4.5 miles southeast of Cloverdale, and 13 miles southeast of Hinckley.	-	1966-70	5-18-70	67.2
05336005	Bear Creek near Hinckley, Minn.	NE¼NE¼ sec.21, T.40 N., R.19 W., Pine County, at bridge on St. Croix State Park Road, 12 miles southeast of Hinckley.	-	1967, 1970	5-18-70	18.8
05336900	North Branch Grindstone River near Hinckley, Minn.	On line between secs.14 and 15, T.41 N., R.21 W., Pine County, at bridge on county road, 1.8 miles northwest of Hinckley.	-	1967, 1970	5-19-70	19.9
05336990	South Branch Grindstone River near Hinckley, Minn.	NW¼NW¼ sec.23, T.141 N., R.21 W., Pine County, at culvert on county road, 1.5 miles northwest of Hinckley.	-	1967, 1970	5-19-70	7.02
05337010	Grindstone River near Hinckley, Minn.	On center of line between secs.21 and 28, T.41 N., R.20 W., Pine County, at bridge on State Highway 48, 2.8 miles east of Hinckley.	-	1967, 1970	5-19-70	35.8
05337200	Snake River near Warman, Minn.	On line between secs.15 and 22, T.41 N., R.23 W., Kanabec County, at bridge on County Highway 3, 0.25 mile east of bridge over Snowshoe Brook, 0.4 mile upstream from Snowshoe Brook, and 3.2 miles southeast of Warman.	-	1967, 1969-70	5-20-70	115
05337220	Snowshoe Brook near Warman, Minn.	On line between secs.15 and 22, T.41 N., R.23 W., Kanabec County, at bridge on County Highway 3, 0.25 mile west of bridge over Snake River, 0.2 mile upstream from mouth, and 3 miles southeast of Warman.	-	1967, 1970	5-20-70	1.96
05337300	Knife River near Warman, Minn.	On line between sec.7, T.41 N., R.24 W., and sec.12, T.41 N., R.25 W., on Kanabec-Mille Lacs County line, at bridge on State Highway 47, 7 miles west of Warman.	-	1967, 1970	5-20-70	8.14
05337400	Knife River near Mora, Minn.	SE¼SE¼ sec.27, T.40 N., R.24 W., Kanabec County, at bridge on County Highway 77, 2.5 miles north of Mora.	-	1966-70	5-20-70	36.3
05337530	Little Ann River near Mora, Minn.	On line between secs.23 and 26, T.40 N., R.25 W., Kanabec County, at bridge on County Highway 26, 7 miles northwest of Mora.	-	1967, 1970	5-20-70	5.63
05337550	Ann River near Mora, Minn.	SE¼SE¼ sec.28, T.39 N., R.24 W., Kanabec County, at bridge on County Highway 14, 0.4 mile upstream from Fish Lake, and 3.5 miles southwest of Mora.	-	1967, 1970	5-20-70	21.3
05337600	Groundhouse River near Ogilvie, Minn.	On line between secs. 1 and 12, T.38 N., R.25 W., Kanabec County, at bridge on county highway, 1.4 miles upstream from South Fork, and 2 miles south of Ogilvie.	-	1967, 1969-70	5-20-70	11.9
05337650	South Fork Groundhouse River near Ogilvie, Minn.	On line between secs.12 and 13, T.38 N., R.25 W., Kanabec County, at bridge on county highway, 0.7 mile upstream from mouth, and 3 miles southeast of Ogilvie.	-	1967, 1969-70	5-20-70	11.1
05337700	Groundhouse River at Brunswick, Minn.	Lat 45°47'25", long 93°16'30", in SW¼SE¼ sec.12, T.38 N., R.24 W., Kanabec County, at bridge on county highway at Brunswick, ~~and~~ 2 miles upstream from mouth.	-	1966-70	5-19-70	35.5

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		St. Croix River basin--Continued				
05337790	Mud Creek at Quamba, Minn.	At intersection of secs.25, 26, 35, and 36, T.40 N., R.23 W., Kanabec County, at bridge on State Highway 23, 0.8 mile northeast of Quamba.	-	1967, 1970	5-19-70	2.36
05337900	Snake River at Grasston, Minn.	SW¼SE¼ sec.12, T.38 N., R.23 W., Kanabec County, at bridge on State Highway 70, near south boundary of Grasston.	-	1967, 1969-70	5-19-70	340
05339800	Sunrise River near Wyoming, Minn.	SW¼NW¼ sec.22, T.33 N., R.21 W., Chisago County, at bridge on State Highway 98, 2 miles east of Wyoming.	-	1967, 1969-70	5-21-70	5.76
05339950	West Branch Sunrise River at Stacy, Minn.	SE¼NE¼ sec.31, T.34 N., R.21 W., Chisago County, at bridge on county road, at southwest edge of Stacy.	-	1967, 1969-70	5-21-70	24.9
05340100	North Branch Sunrise River tributary near Weber, Minn.	NW¼NW¼ sec.27, T.35 N., R.22 W., Isanti County, at culvert on County Highway 5, 0.6 mile upstream from mouth, and 2.8 miles northeast of Weber.	-	1969-70	5-21-70	1.40
05340110	North Branch Sunrise River near Weber, Minn.	NE¼NW¼ sec.26, T.35 N., R.22 W., Isanti County, at bridge on County Highway 5, 3.8 miles northeast of Weber.	-	1969-70	5-21-70	7.50
05340170	North Branch Sunrise River near North Branch, Minn.	Lat 45°30'48", long 92°53'33", on line between secs.18 and 19, T.35 N., R.20 W., Chisago County, at bridge on State Highway 95, 4 miles east of North Branch.	a72	1967-70	5-21-70	32.7
05340550	Lawrence Creek at Franconia, Minn.	SE¼SE¼ sec.3, T.33 N., R.19 W., Chisago County, at county road in Franconia, and 2.9 miles southeast of Shafer.	-	1969-70	5-21-70	1.65
		Vermillion River basin				
05345000	Vermillion River near Empire City, Minn.	Lat 44°40'00", long 93°03'17", on line between secs.23 and 24, T.114 N., R.19 W., Dakota County, at bridge on County Highway 79, 2 miles northwest of Empire City, and 3.7 miles southwest of Coates.	110	1942-45≠, 1969-70	2-18-70 5- 5-70 8- 4-70	17.8 50.5 22.1
05346000	Vermillion River at Hastings, Minn.	Lat 44°43'12", long 92°51'57", in SE¼SW¼ sec.33, T.115 N., R.17 W., Dakota County, at bridge on County Highway 47 in Hastings, 0.7 mile upstream from mill dam, and 3 miles upstream from Vermillion Slough.	195	1935-38, 1940-41, 1942-47≠, 1949, 1952, 1965-70	12- 3-69 1- 7-70 2-18-70 5- 6-70 8- 4-70	45.8 34.2 24.4 65.9 34.2
		Cannon River basin				
05352810	Turtle Creek near Owatonna, Minn.	On line between secs.32 and 33, T.107 N., R.20 W., Steele County, at bridge on county road, 0.7 mile upstream from mouth, and 3.7 miles south of Owatonna	-	1969-70	8-18-70 8-27-70	.83 .19
05352900	Maple Creek at Owatonna, Minn.	Lat 44°05'42", long 93°15'22", in NW¼NW¼ sec.10, T.107 N., R.20 W., Steele County, at Elm Street bridge in Owatonna, ~~and~~ 0.3 mile upstream from mouth.	-	1969-70	8-18-70 8-27-70	2.33 1.47
05354600	Wolf Creek near Dundas, Minn.	On line between secs.21 and 22, T.111 N., R.20 W., Rice County, at bridge on County Highway 8, 1.5 miles southwest of Dundas.	-	1969-70	8-18-70 8-26-70	.78 .61
05355020	Heath Creek at Northfield, Minn.	NW¼SE¼ sec.2, T.111 N., R.20 W., Rice County, at bridge on County Highway 78, in Northfield.	-	1965, 1969-70	8-18-70 8-26-70	.16 .10
05355040	Chub Creek at Randolph, Minn.	N½ sec.7, T.112 N., R.18 W., Dakota County, at bridge on County Highway 94, at west boundary of Randolph.	-	1965, 1969-70	8-18-70 8-26-70	8.37 6.58

≠ Operated as a continuous-record gaging station.
a Approximately.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Cannon River basin--Continued				
05355060	Spring Creek near Cannon Falls, Minn.	NE¼SW¼ sec.16, T.112 N., R.18 W., Goodhue County, at bridge on county road, 4.4 miles west of Cannon Falls.	-	1969-70	8-18-70 8-26-70	.57 .48
05355080	Prairie Creek near Cannon Falls, Minn.	On line between secs.21 and 28, T.112 N., R.18 W., Goodhue County, at bridge on State Highway 19, 4.5 miles southwest of Cannon Falls.	-	1966-70	5- 5-70 6- 2-70 7- 3-70 8- 4-70 8-25-70	27.5 64.4 16.6 13.6 8.14
05355140	Little Cannon River near Cannon Falls, Minn.	Lat 44°28'24", long 92°55'53", in SW¼ sec.25, T.112 N., R.18 W., Goodhue County, at bridge on county highway, 2.5 miles south of Cannon Falls.	-	1966-70	5- 5-70 6- 2-70 7- 3-70 8- 4-70 8-25-70	42.0 139 33.2 20.9 12.4
05355215	Belle Creek near Vasa, Minn.	SE¼ sec.4, T.112 N., R.16 W., Goodhue County, at bridge on county highway, 2 miles north of Vasa.	-	1966-70	5- 4-70 7- 6-70 8- 3-70 8-25-70	22.9 18.7 14.6 9.87
		Spring Creek basin				
05355260	Spring Creek near Red Wing, Minn.	On line between secs.27 and 28, T.113 N., R.15 W., Goodhue County, at bridge on County Highway 53, 4 miles west of Red Wing.	-	1969-70	8-20-70	2.80
		Hay Creek basin				
05355280	Hay Creek at Red Wing, Minn.	Lat 44°38'08", long 92°33'45", in SE¼NW¼ sec.36, T.113 N., R.15 W., Goodhue County, at bridge on county road, in Red Wing.	a48	1969-70	8-20-70	14.8
		Wells Creek basin				
05355350	Wells Creek near Frontenac, Minn.	NE¼NW¼ sec.13, T.112 N., R.14 W., Goodhue County, at bridge on county road leading to Old Frontenac, 1.2 miles south of Old Frontenac, and 1.6 miles east of Frontenac.	-	1969-70	6-24-70	24.9
		Miller Creek basin				
05355360	Miller Creek at Lake City, Minn.	NW¼SE¼ sec.8, T.111 N., R.12 W., Wabasha County, at bridge on County Highway 9, 1.3 miles south of Lake City.	-	1969-70	6-24-70	2.38
		Zumbro River basin				
05372930	Bear Creek at Rochester, Minn.	Lat 44°00'29", long 92°26'44", in SW¼SE¼ sec.1, T.106 N., R.14 W., Olmsted County, at bridge on U.S. Highways 14 and 52, in Rochester, and 1.2 miles upstream from mouth.	80.0	1965, 1968-70	6- 5-70	99.5
05372950	Silver Creek at Rochester, Minn.	Lat 44°01'44", long 92°28'18", near center of sec.31, T.107 N., R.14 W., Olmsted County, at bridge on county road, at east edge of Rochester, and 1.7 miles upstream from mouth.	17.3	1968-70	6- 4-70	15.0
05373100	Milliken Creek near Concord, Minn.	SW¼NE¼ sec.29, T.108 N., R.16 W., Dodge County, at bridge on County Highway 52, 3.5 miles southeast of Concord.	-	1970	8-20-70	.36
05373130	North Branch Middle Fork Zumbro River at Pine Island, Minn.	W½ sec.32, T.109 N., R.15 W., Goodhue County, at bridge on Main Street, in Pine Island, and 0.25 mile upstream from Middle Fork Zumbro River.	-	1967, 1970	8-20-70	5.03
05373150	Middle Fork Zumbro River near Oronoco, Minn.	Lat 44°10'10", long 92°34'24", at center of SW¼ sec.12, T.109 N., R.15 W., Olmsted County, at bridge on County Highway 31, 2 miles west of Oronoco.	-	1969-70	6- 5-70	153
05373200	Dodge Center Creek near Dodge Center, Minn.	SW¼NE¼ sec.32, T.107 N., R.17 W., Dodge County, at bridge on County Highway H, 1.5 miles west of Dodge Center.	-	1970	8-19-70	1.75

a Approximately.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Zumbro River basin--Continued				
05373290	South Branch Middle Fork Zumbro River near Oronoco, Minn.	NW¼SW¼ sec.23, T.108 N., R.14 W., Olmsted County, at bridge on County Highway 3, 3.5 miles southwest of Oronoco.	-	1969-70	6- 5-70 8-19-70	156 17.1
05373400	Dry Run Creek near Oronoco, Minn.	NW¼NE¼ sec.4, T.108 N., R.14 W., Olmsted County, at bridge on county road, 2 miles northeast of Oronoco.	-	1970	8-19-70	3.96
05373850	North Fork Zumbro River at Mazeppa, Minn.	NW¼NW¼ sec.7, T.109 N., R.14 W., Wabasha County, at bridge on County Highway 1, at the southwest edge of Mazeppa.	-	1969-70	6- 5-70	135
05373950	Trout Brook near Mazeppa, Minn.	Near center of sec.5, T.109 N., R.14 W., Wabasha County, at bridge on State Highway 60, 1.3 miles east of Mazeppa.	-	1969-70	6-26-70	12.1
05373995	Cold Creek at Zumbro Falls, Minn.	SE¼NE¼ sec.36, T.109 N., R.14 W., Wabasha County, at triple box culvert on State Highway 60, 0.2 mile upstream from mouth, and 0.6 mile northwest of Zumbro Falls.	45.9	1916, 1969-70	6-26-70	7.46
05374420	Long Creek near Millville, Minn.	SE¼SW¼ sec.3, T.109 N., R.12 W., Wabasha County, at bridge on new road along the right bank of the Zumbro River, about 3.2 miles northeast of Millville.	-	1970	6-24-70	5.02
05374450	Middle Creek near Thielman, Minn.	On line between secs.2 and 11, T.109 N., R.12 W., Wabasha County, at bridge on county road, 2.5 miles southwest of Thielman, and 3.7 miles northeast of Millville.	-	1970	6-24-70	3.73
05374480	Spring Creek near West Albany, Minn.	N½SW¼ sec.27, T.110 N., R.12 W., Wabasha County, at bridge on County Highway 11, 0.8 mile upstream from mouth, and 2.2 miles east of West Albany.	-	1969-70	5-22-70	8.76
05374520	West Indian Creek at Thielman, Minn.	SW¼NW¼ sec.31, T.110 N., R.11 W., Wabasha County, at bridge on County Highway 4, 0.5 mile east of Thielman.	-	1970	6-24-70	7.43
05374600	Trout Brook at Dumfries, Minn.	SW¼NE¼ sec.10, T.110 N., R.11 W., Wabasha County, at bridge on State Highway 60, 0.3 mile east of County Highway 30, in Dumfries.	-	1969-70	5-22-70	.21
		Gorman Creek basin				
05375000	Gorman Creek near Kellogg, Minn.	On line between secs.34 and 35, T.110 N., R.10 W., Wabasha County, at bridge on U.S. Highway 61, 1.1 miles south of Kellogg.	-	1969-70	5-22-70	.65
		Whitewater River basin				
05376200	Middle Fork Whitewater River at Elba, Minn.	SW¼SE¼ sec.9, T.107 N., R.10 W., Winona County, at bridge on State Highway 74, at Elba, 0.4 mile upstream from confluence with North Fork, and 0.5 mile south of State Highway 74 bridge over North Fork.	53.4	1969-70	5-22-70	20.7
		Garvin Brook basin				
05378240	Garvin Brook at Minnesota City, Minn.	On line between secs.10 and 11, T.107 N., R.8 W., Winona County, at bridge on one lane road, 0.6 mile southwest of Minnesota City.	-	1935-37, 1939, 1969-70	5-21-70	21.8
05378400	Rollingstone Creek near Minnesota City, Minn.	NW¼SW¼ sec.3, T.107 N., R.8 W., Winona County, at bridge on county road, 1.4 miles west of Minnesota City.	-	1969-70	5-21-70	18.1
		Burns Valley Creek basin				
05379050	Burns Valley Creek at Winona, Minn.	On line between secs.35 and 36, T.107 N., R.7 W., Winona County, at bridge on County Highway 17, at southeast edge of Winona.	-	1967-70	5-21-70	5.41

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Pleasant Valley Creek basin				
05379090	Pleasant Valley Creek at Winona, Minn.	On line between sec.36, T.107 N., R.7 W., and sec.1, T.106 N., R.7 W., Winona County, at bridge on County Highway 15, at southeast edge of Winona.	-	1967-70	5-21-70	4.97
		Root River basin				
05383740	North Branch Root River near Chatfield, Minn.	Lat 43°49'21", long 92°10'24", in SE¼SE¼ sec.8, T.104 N., R.11 W., Fillmore County, at bridge on County Highway 5, 1.6 miles upstream from North Branch, and 1.7 miles southeast of Chatfield.	-	1969-70	5-20-70	130
05383900	Middle Branch Root River near Chatfield, Minn.	Lat 43°48'24", long 92°11'18", on line between secs.17 and 18, T.104 N., R.11 W., Fillmore County, at bridge on County Highway 7, 1 mile upstream from North Branch, and 2.7 miles south of Chatfield.	-	1969-70	5-20-70	136
05384900	Money Creek near Houston, Minn.	NE¼SE¼ sec.19, T.104 N., R.6 W., Houston County, at bridge on State Highway 76, 2.4 miles northwest of Houston.	a78	1969-70	5-21-70	27.5
		Winnebago Creek basin				
05387200	Winnebago Creek near New Albin, Iowa	SE¼SW¼ sec.27, T.101 N., R.3 W., Houston County, Minn., at bridge on County Highway 5, 1.3 miles northwest of New Albin.	a90	1969-70	5-21-70	27.5
		Des Moines River basin				
05474770	Beaver Creek near Currie, Minn.	At center of W½ sec.24, T.107 N., R.41 W., Murray County, at bridge on county road, 2.8 miles southwest of Currie.	-	1969-70	8-25-70	.29
05474800	Lime Creek near Avoca, Minn.	Near intersection of secs.27, 28, 33, and 34, T.106 N., R.39 W., Murray County, at bridge on County Highway 6, 0.6 mile upstream from mouth, and 6.2 miles east of Avoca.	-	1969-70	8-25-70	.16
05474920	Okabena Creek at Okabena, Minn.	On line between secs.7 and 8, T.103 N., R.37 W., Jackson County, at bridge on County Highway 9, 0.3 mile north of Okabena.	-	1969-70	8-27-70	5.55
05474980	Jack Creek near Heron Lake, Minn.	On line between secs.31 and 32, T.104 N., R.37 W., Murray County, at bridge on County Highway 9, 1.8 miles south of Heron Lake.	-	1969-70	8-27-70	1.12
		Big Sioux River basin				
06482540	Split Rock Creek near Jasper, Minn.	On line between secs.26 and 35, T.104 N., R.47 W., Rock County, at bridge on county road, 5.4 miles southwest of Jasper.	-	1969-70	8-26-70	1.59
06482710	Beaver Creek near Luverne, Minn.	On line between secs.2 and 11, T.102 N., R.46 W., Rock County, at bridge on County Highway 5, 5.4 miles west of Luverne.	-	1969-70	8-26-70	.03
06482720	Beaver Creek tributary near Luverne, Minn.	On line between secs.6 and 7, T.102 N., R.45 W., Rock County, at bridge on County Highway 5, 3.8 miles west of Luverne.	-	1969-70	8-26-70	0
06482740	Beaver Creek near Beaver Creek, Minn.	On line between secs.35 and 36, T.102 N., R.47 W., Rock County, at bridge on State Highway 23, 3.8 miles southwest of Beaver Creek.	-	1969-70	8-26-70	1.20
06482930	Rock River at Edgerton, Minn.	SW¼NW¼ sec.28, T.105 N., R.44 W., Pipestone County, at bridge on County Highway 10, at west edge of Edgerton, and 1.7 miles upstream from Chanarambie Creek.	-	1969-70	8-25-70	1.86

a Approximately.

Discharge measurements made at low-flow partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Measurements	
					Date	Discharge (cfs)
		Big Sioux River basin--Continued				
06482935	Chanarambie Creek at Edgerton, Minn.	W½W½ sec.27, T.105 N., R.44 W., Pipestone County, at bridge on County Highway 1 in Edgerton, and 1 mile upstream from mouth.	-	1969-70	8-25-70	.80
06482945	Rock River near Hardwick, Minn.	On line between secs.18 and 19, T.103 N., R.44 W., Rock County, at bridge on County Highway 8, 4.3 miles southeast of Hardwick.	-	1969-70	8-26-70	7.81
06482980	Champepadan Creek near Hardwick, Minn.	On line between secs.20 and 21, T.103 N., R.44 W., Rock County, at bridge on County Highway 9, 1.2 miles upstream from mouth, and 5.8 miles southeast of Hardwick.	-	1969-70	8-26-70	.81
06483000	Rock River at Luverne, Minn.	NE¼SE¼ sec.11, T.102 N., R.45 W., Rock County, at dam at Main Street in Luverne.	440	1911-14≠, 1967-70	8-26-70	10.4
06483030	Elk Creek near Luverne, Minn.	On line between sec.25, T.102 N., R.45 W., and sec.30, T.102 N., R.44 W., at bridge on County Highway 9, 4 miles southeast of Luverne.	-	1969-70	8-26-70	.06
06483070	Ash Creek at Ash Creek, Minn.	NE¼SE¼ sec.14, T.101 N., R.45 W., Rock County, at bridge on county road, 0.7 mile north of Ash Creek.	-	1969-70	8-26-70	0
06483240	Kanaranzi Creek near Kanaranzi, Minn.	On line between sec.4, T.100 N., R.44 W., and sec.33, T.101 N., R.44 W., Rock County, at Iowa-Minnesota border, at bridge on county road, 5.3 miles southwest of Kanaranzi.	-	1969-70	8-26-70	3.71
06483310	Mud Creek near Hills, Minn.	On line between secs.27 and 34, T.101 N., R.40 W., Rock County, at bridge on county road, 1.2 miles southeast of Hills.	-	1969-70	8-26-70	0
		Little Sioux River basin				
*06603530	Little Sioux River near Spafford, Minn.	Lat 43°36'08", long 95°15'27", on line between secs.27 and 34, T.102 N., R.37 W., Jackson County, at bridge on county road, 1.6 miles downstream from Jackson County ditch No. 11, and 5.8 miles east of Spafford.	-	1962-67, 1969-70	8-27-70	.48

* Also a crest-stage partial-record station.
≠ Operated as a continuous-record gaging station.

Crest-stage partial-record stations

The following table contains annual maximum discharge for crest-stage stations. A crest-stage is a device which will register the peak stage occurring between inspections of the gage. A stage-discharge relation for each gage is developed from discharge measurements made by indirect measurements of peak flow or by current meter. The date of the maximum discharge is not always certain but is usually determined by comparison with nearby continuous-record stations, weather records, or local inquiry. Only the maximum discharge for each water year is given. Information on some lower floods may have been obtained, and discharge measurements may have been made for purposes of establishing the stage-discharge relation, but these are not published herein. The years given in the period of record represent water years for which the annual maximum has been determined.

Annual maximum discharge at crest-stage partial-record stations during water year 1970

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
		Streams tributary to Lake Superior					
04011370	Little Devil Track River near Grand Marais, Minn.	Lat 47°47'09", long 90°19'44", in NE¼NW¼ sec.9, T.61 N., R.1 E., Cook County, at culvert on County Highway 12, 1.6 miles above mouth, and 2.5 miles north of Grand Marais.	7.49	1961-70	4-29-70	18.10	188
04011390	Little Devil Track River tributary near Grand Marais, Minn.	Lat 47°47'17", long 90°19'20", in SE¼SE¼ sec.4, T.61 N., R.1 E., Cook County, at culvert on County Highway 55, 0.2 mile above mouth, and 2.8 miles north of Grand Marais.	.47	1966-70	5- 5-66 4-17-67 6-14-68 10- 9-68 9-21-70	b10.88 16.41 10.09 16.02 16.02	a5.3 40 a6.4 a19 19
04013100	Lake Superior tributary near Taconite Harbor, Minn.	Lat 47°29'14", long 90°59'19", in SW¼SE¼ sec.20, T.58 N., R.5 W., Cook County, at culvert on U.S. Highway 61, 0.2 mile above mouth, and 3.7 miles southwest of Taconite Harbor.	1.56	1964-70	4-26-70	7.71	48
04013200	Caribou River near Little Marais, Minn.	Lat 47°27'51", long 91°01'50", in NW¼SE¼ sec.36, T.58 N., R.6 W., Lake County, at culvert on U.S. Highway 61, 0.2 mile above mouth, and 5.2 miles northeast of Little Marais.	22.7	1961-70	4-27-70	13.12	500
04015150	Crow Creek near Silver Creek, Minn.	Lat 47°08'30", long 91°34'38", in SW¼SW¼ sec.23, T.54 N., R.10 W., Lake County at culvert on County Highway 3, 2.3 miles northeast of Silver Creek, and 4.0 miles above mouth.	1.07	1960-70	4-27-70	8.72	30
04015200	Encampment River tributary at Silver Creek, Minn.	Lat 47°07'01", long 91°36'04", in NE¼SE¼ sec.33, T.54 N., R.10 W., Lake County, at culvert on County Highway 3, 0.3 mile north of Silver Creek, and 1.4 miles above mouth.	.96	1960-70	5- 9-70	7.21	31
04015250	Silver Creek tributary near Two Harbors, Minn.	Lat 47°04'40", long 91°36'49", in SW¼NE¼ sec.16, T.53 N., R.10 W., Lake County, at culvert on County Highway 3, 1.0 mile above mouth, and 4.5 miles northeast of Two Harbors.	3.72	1965-70	5- 9-70	5.16	203
04015300	Little Stewart River near Two Harbors, Minn.	Lat 47°03'52", long 91°40'03", in SE¼NE¼ sec.24, T.53 N., R.11 W., Lake County, at culvert on county highway, 2.0 miles above mouth, and 2.7 miles north of Two Harbors.	5.54	1960-70	4- 8-70	10.98	185
04015360	Lake Superior tributary No. 2 at French River, Minn.	Lat 46°53'43", long 91°54'31", in SW¼SE¼ sec.18, T.51 N., R.12 W., St. Louis County, at culvert on U.S. Highway 61, 0.35 mile above mouth, and 0.7 mile west of French River.	1.41	1964-70	4- 8-70	18.24	69
04015370	Talmadge River at Duluth, Minn.	Lat 46°53'20", long 91°55'21", in SE¼NE¼ sec.24, T.51 N., R.13 W., St. Louis County, at culvert on U.S. Highway 61, 0.6 mile above mouth, and 0.5 mile northeast of Duluth city limits.	5.79	1964-70	4- 8-70	13.68	139
04015400	Miller Creek at Duluth, Minn.	Lat 46°49'01", long 92°10'42", in SE¼NE¼ sec.13, T.50 N., R.15 W., St. Louis County, at culvert on U.S. Highway 53, 0.2 mile northwest of Duluth city limits.	4.92	1960-70	4- 8-70	15.28	134
04017700	McKinley Lake tributary at McKinley, Minn.	Lat 47°30'41", long 92°25'11", in SW¼NE¼ sec.18, T.58 N., R.16 W., St. Louis County, at culvert on State Highway 135 at west edge of McKinley.	.42	1960-70	4- 8-70	b7.33	2.7
04018800	East Two River tributary at Virginia, Minn.	Lat 47°31'54", long 92°33'51", in NE¼NE¼ sec.12, T.58 N., R.18 W., St. Louis County, at culvert on U.S. Highway 169, 0.2 mile west of Virginia city limits, and 1.1 miles above mouth.	4.26	1959-70	6-11-70	6.30	26

a Not previously published.
b Backwater from ice.

Annual maximum discharge at crest-stage partial-record stations during water year 1970--Continued

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
		Streams tributary to Lake Superior--Continued					
04024100	Rock Creek near Blackhoof, Minn.	Lat 46°32'10", long 92°22'12", in SW¼SE¼ sec.21, T.47 N., R.16 W., Carlton County, at culvert on State Highway 23, 4.0 miles above mouth, and 4.4 miles east of Blackhoof.	4.94	1961-65, 1967-70	5-21-70	28.92	1,270
04024110	Rock Creek tributary near Blackhoof, Minn.	Lat 46°32'14", long 92°22'05", in NE¼SE¼ sec.21, T.47 N., R.16 W., Carlton County, at culvert on State Highway 23, 0.1 mile above mouth, and 4.5 miles east of Blackhoof.	.20	1961-70	5-21-70	18.42	36
04024200	South Fork Nemadji River near Holyoke, Minn.	Lat 46°29'38", long 92°24'36", in SE¼SE¼ sec.6, T.46 N., R.16 W., Carlton County, at culvert on State Highway 23, 1.7 miles below Clear Creek, and 2.0 miles northwest of Holyoke.	19.4	1961-70	5-21-70	17.99	2,100
		Red River of the North basin					
05047600	West Branch Mustinka River near Graceville, Minn.	Lat 45°37'43", long 96°26'35", in NW¼NW¼ sec.22, T.125 N., R.46 W., Traverse County, at culverts on county highway, 4.1 miles north of Graceville.	56.7	1964-70	4-13-64 7- 6-65 3-18-66 6-14-67 4- 7-70	8.25 8.80 9.41 8.46 b8.58	a41 a59 a83 a47 (≠)
05047700	West Branch Mustinka River tributary near Graceville, Minn.	Lat 45°36'53", long 96°19'47", in NE¼NW¼ sec.28, T.125 N., R.45 W., Traverse County, at culvert on county highway, 0.6 mile northeast of Graceville.	3.37	1964-70	4-13-64 4- 7-70	8.76 b8.04	c80 27
05049200	Eighteen Mile Creek near Wheaton, Minn.	Lat 45°47'18", long 96°31'52", on west quarter of line between secs.24 and 25, T.127 N., R.47 W., Traverse County, at culvert on County Highway 67, 1.4 miles above mouth, and 2.0 miles southwest of Wheaton.	68.5	1965-68, 1970	3- 3-66 4-22-68 4- 8-70	b9.85 4.90 4.83	a246 a70 (≠)
05060800	Buffalo River near Callaway, Minn.	Lat 47°01'15", long 95°54'50", in SW¼SW¼ sec.17, T.141 N., R.41 W., Becker County, at culvert on U.S. Highway 59, 2.7 miles north of Callaway.	49.9	1960-70	4- 8-70	-	d250
05061200	Whisky Creek at Barnesville, Minn.	Lat 46°39'35", long 96°23'54", in SE¼SW¼ sec.20, T.137 N., R.45 W., Clay County, at culvert on State Highway 34, 0.7 mile above Blue Eagle Lake, and 1.0 mile northeast of Barnesville.	25.3	1961-64, 1965-66≠, 1967-70	6-17-70	3.78	73
05061400	Hay Creek above Downer, Minn.	Lat 46°44'37", long 96°25'12", in NW¼NW¼ sec.30, T.138 N., R.45 W., Clay County, at culvert on county road, 3.1 miles east of Downer.	5.81	1961-70	4- 8-70	5.96	15
05062280	Wild Rice River tributary near Bagley, Minn.	Lat 47°27'00", long 95°23'00", in SW¼NW¼ sec.21, T.146 N., R.37 W., Clearwater County, at culvert on State Highway 92, 5.0 miles south of Bagley.	3.34	1961-70	4-26-70	8.09	28
05062470	Marsh River tributary near Mahnomen, Minn.	Lat 47°19'35", long 96°04'40", in SE¼SW¼ sec.36, T.145 N., R.43 W., Norman County, at culvert on State Highway 31, a quarter mile above mouth, and 5¼ miles west of Mahnomen.	6.57	1961-70	4- 7-70	b12.81	107
05062700	Wild Rice River tributary near Twin Valley, Minn.	Lat 47°17'50", long 96°19'40", in SW¼SE¼ sec.12, T.144 N., R.45 W., Norman County, at culvert on State Highway 31, 1.2 miles above mouth, and 4¾ miles northwest of Twin Valley.	2.25	1961-70	6-16-70	14.76	324
05062800	Coon Creek near Twin Valley, Minn.	Lat 47°15'55", long 96°20'35", in NE¼NE¼ sec.26, T.144 N., R.45 W., Norman County, at bridge on County Highway 28, 1.1 miles above mouth, and 4.0 miles west of Twin Valley.	32.1	1962-70	6-16-70	12.11	1,090
05063200	South Branch Wild Rice River near Ogema, Minn.	Lat 47°07'20", long 95°57'35", in SE¼SE¼ sec.11, T.142 N., R.42 W., Becker County, at culvert on county highway, 2 miles northwest of Ogema.	6.50	1963-70	4- 9-69 4- 7-70	8.68 6.79	a115 76
05073600	South Branch Battle River at Northome, Minn.	Lat 47°52'20", long 94°17'50", in NE¼ sec.25, T.151 N., R.29 W., Koochiching County, at culvert on U.S. Highway 71, 0.8 mile west of Northome, and 3 miles above Battle Lake.	3.19	1960-70	4-26-70	b14.94	84

≠ Discharge not determined.
≠ Operated as a continuous-record gaging station.
a Not previously published.
b Backwater from ice.
c Revised.
d Estimated.

Annual maximum discharge at crest-stage partial-record stations during water year 1970--Continued

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
		Red River of the North basin--Continued					
05073750	South Branch Cormorant River tributary near Blackduck, Minn.	Lat 47°46'20", long 94°31'20", in NW¼NW¼ sec.32, T.150 N., R.30 W., Beltrami County, at culvert on County Highway 304, 3 miles above mouth, and 3¼ miles north of Blackduck.	4.45	1960-70	4-26-70	14.60	111
05073800	Perry Creek near Shooks, Minn.	Lat 47°52'00", long 94°32'50", in NW¼SW¼ sec.30, T.151 N., R.30 W., Beltrami County, at culvert on State Highway 72, 5 miles west of Shooks.	2.41	1960-70	4-26-70	6.86	41
05076600	Red Lake River tributary near Thief River Falls, Minn.	Lat 48°04'44", long 96°12'15", in SW¼SE¼ sec.8, T.153 N., R.43 W., Pennington County, at culvert on County Highway 7, 0.5 mile above mouth, and 3.1 miles south of Thief River Falls.	-	1962-70	4-20-70	7.99	111
05078100	Lost River at Gonvick, Minn.	Lat 47°43'55", long 95°31'10", in NE¼NE¼ sec.16, T.149 N., R.38 W., Clearwater County, at culvert on county highway, 0.5 mile south of Gonvick, and 3 miles below Pine Lake.	30.9	1960-70	4-26-70	9.50	(✗)
05078180	Lost River tributary No. 2 near Clearbrook, Minn.	Lat 47°38'40", long 95°26'40", in NW¼ sec.13, T.148 N., R.38 W., Clearwater County, at culvert on county highway, 3.5 miles south of Clearbrook.	1.79	1960-70	4-26-70	8.80	40
05078200	Lost River tributary at Clearbrook, Minn.	Lat 47°41'50", long 95°25'45", in SW¼NW¼ sec.29, T.149 N., R.37 W., Clearwater County, at culvert on county highway at north edge of Clearbrook, three-quarters of a mile above mouth.	3.05	1960-70	4-26-70	e11.06	62
05078400	Clearwater River tributary near Plummer, Minn.	Lat 47°52'35", long 96°08'25", in SE¼SE¼ sec.22, T.151 N., R.43 W., Red Lake County, at culvert on county highway, 1.2 miles above mouth, and 5½ miles southwest of Plummer.	1.17	1961-70	5-15-70	8.80	106
		Lake of the Woods basin					
05128300	Pike River near Gilbert, Minn.	Lat 47°29'34", long 92°29'15", in NE¼SW¼ sec.22, T.58 N., R.17 W., St. Louis County, at culvert on State Highway 135, 1.1 miles west of Gilbert.	-	1966-70	4-27-70	7.25	16
05128700	Pike River tributary near Wahlsten, Minn.	Lat 47°43'04", long 92°17'12", in SW¼SW¼ sec.32, T.61 N., R.15 W., St. Louis County, at culvert on State Highway 135, 1.2 miles south of Wahlsten, and 2.7 miles above mouth.	1.93	1961-70	5-21-70	7.28	71
05129710	Johnson Creek near Britt, Minn.	Lat 47°39'40", long 92°38'03", in NW¼NE¼ sec.28, T.60 N., R.18 W., St. Louis County, at culvert adjacent to U.S. Highway 53, 0.6 mile below Sand Lake, and 5.9 miles west of Britt.	6.92	1961-64, 1966-70	6-11-70	7.69	26
05130300	Boriin Creek near Chisholm, Minn.	Lat 47°36'14", long 92°51'58", in SE¼SE¼ sec.9, T.59 N., R.20 W., St. Louis County, at culvert on State Highway 73, 1.2 miles above mouth, and 7.8 miles north of Chisholm.	13.7	1959-70	4-27-70	12.62	318
		Split Hand Creek basin					
05215000	Smith Creek near Hill City, Minn.	Lat 47°05'05", long 93°35'05", in SE¼NW¼ sec.13, T.53 N., R.26 W., Itasca County, at culvert on U.S. Highway 169, 6.5 miles north of Hill City.	5.06	1961-70	4-19-70	5.48	104
		Swan River basin					
05216700	O'Brien Creek near Nashwauk, Minn.	Lat 47°22'59", long 93°08'08", in NE¼NE¼ sec.33, T.57 N., R.22 W., Itasca County, at culvert on U.S. Highway 169, 1.5 miles east of Nashwauk, and 3.0 miles above Welcome Creek.	8.26	1959-70	4-19-70	b8.59	50
05216980	Swan River tributary at Warba, Minn.	Lat 47°07'15", long 93°15'00", in NW¼ sec.34, T.54 N., R.23 W., Itasca County, at culvert on U.S. Highway 2, three-quarters of a mile above mouth and 1 mile southeast of Warba.	2.36	1961-70	4-19-70	5.60	30

✗ Discharge not determined.
b Backwater from ice.
e Affected by shifting control.

Annual maximum discharge at crest-stage partial-record stations during water year 1970--Continued

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
		Bluff Creek basin					
05217700	Bluff Creek near Jacobson, Minn.	Lat 47°00'20", long 93°17'40", in SW¼NW¼ sec.8, T.52 N., R.23 W., Aitkin County, at culvert on State Highway 34, 1¾ miles west of Jacobson.	2.95	1961-70	4-19-70	7.15	26
		Crow Wing River basin					
05244100	Kitten Creek near Sebeka, Minn.	Lat 46°40'30", long 95°04'40", in SE¼SE¼ sec.15, T.137 N., R.35 W., Wadena County, at culvert on county highway, 3¾ miles above mouth, and 3¾ miles north of Sebeka.	9.34	1961-70	4- 9-70	10.23	125
05244200	Cat River near Nimrod, Minn.	Lat 46°37'50", long 94°55'40", in SW¼SW¼ sec.36, T.137 N., R.34 W., Wadena County, at bridge on State Highway 227, 2½ miles west of Nimrod, and 3 miles above mouth.	44.3	1961-70	4-30-70	6.85	240
		Platte River basin					
05267800	Big Mink Creek tributary near Lastrup, Minn.	Lat 46°01'58", long 94°06'13", in NW¼SW¼ sec.14, T.41 N., R.30 W., Morrison County, at culvert on State Highway 25, 1.4 miles above mouth, and 2.1 miles west of Lastrup.	-	1961-70	4-19-70	9.92	21
05267900	Hillman Creek near Pierz, Minn.	Lat 45°58'27", long 94°04'21", in NE¼SE¼ sec.9, T.40 N., R.30 W., Morrison County, at bridge on county highway, 1.1 miles above mouth, and 1.5 miles east of Pierz.	52.6	1964-70	4- 9-69 4-21-70	15.48 13.51	a4,250 290
		Sauk River basin					
05270300	Sauk River tributary at Spring Hill, Minn.	Lat 45°31'22", long 94°48'31", in SW¼NE¼ sec.27, T.124 N., R.33 W., Stearns County, at culvert on State Highway 4, 1.0 mile east of Spring Hill, and 2.7 miles above mouth.	6.42	1960-70	4-19-70	11.21	190
05270310	Sauk River tributary near St. Martin, Minn.	Lat 45°31'45", long 94°44'45", in SE¼ sec.19, T.124 N., R.32 W., Stearns County, at culvert on county highway, 4½ miles northwest of St. Martin.	.23	1960, 1962-70	4-19-70	8.52	33
		Johnson Creek basin					
05271800	Johnson Creek tributary at Luxemburg, Minn.	Lat 45°26'30", long 94°14'46", in NW¼NE¼ sec.30, T.123 N., R.28 W., Stearns County, at culverts on State Highway 15, 0.8 mile south of Luxemburg.	2.77	1964-70	4-19-70	7.93	54
05272000	Johnson Creek tributary near St. Augusta, Minn.	Lat 45°26'52", long 94°12'00", in NE¼SE¼ sec.21, T.123 N., R.28 W., Stearns County, at culverts on county highway, 0.7 mile above mouth, and 3.1 miles southwest of St. Augusta.	-	1964-70	4-19-70	6.04	25
05272300	Johnson Creek near St. Augusta, Minn.	Lat 45°27'49", long 94°09'19", in NW¼SW¼ sec.13, T.123 N., R.28 W., Stearns County, at bridge on County Highway 7, 1.0 mile south of St. Augusta, and 3.3 miles above mouth.	-	1964-70	-	(f)	<90
		Otsego Creek basin					
05273700	Otsego Creek near Otsego, Minn.	Lat 45°17'19", long 93°38'59", in SW¼NE¼ sec.13, T.121 N., R.24 W., Wright County, at culvert on County Highway 39, 1.3 miles above mouth, and 1.9 miles west of Otsego.	3.11	1964-70	5-22-70	4.34	33
		Elk River basin					
05274200	Stony Brook tributary near Foley, Minn.	Lat 45°38'40", long 93°54'50", in NW¼ sec.2, T.36 N., R.29 W., Benton County, at culvert on State Highway 25, a quarter mile above mouth, and 1½ miles south of Foley.	3.11	1960-70	4-19-70	8.12	35

< Less than.
a Not previously published.
f Peak stage did not reach bottom of gage.

Annual maximum discharge at crest-stage partial-record stations during water year 1970--Continued

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
		Crow River basin					
05276100	North Fork Crow River tributary near Paynesville, Minn.	Lat 45°23'20", long 94°46'50", in NW¼ sec.12, T.122 N., R.33 W., Kandiyohi County, at culvert on county highway, 1 mile above mouth, and 3 miles west of Paynesville.	.58	1960-70	4-19-70	17.79	29
05278350	Fountain Creek near Montrose, Minn.	Lat 45°01'20", long 93°56'29", in NE¼NW¼ sec.22, T.118 N., R.26 W., Wright County, at culvert on County Highway 30, 3.3 miles southwest of Montrose.	6.73	1962-70	6-16-70	5.28	29
05278700	Otter Creek near Lester Prairie, Minn.	Lat 44°54'23", long 94°04'24", in SE¼SE¼ sec.28, T.117 N., R.27 W., McLeod County, at culvert on State Highway 7, 2.1 miles northwest of Lester Prairie, and 4.4 miles above mouth.	30.2	1961-70	6-19-70	6.34	43
05278750	Otter Creek tributary near Lester Prairie, Minn.	Lat 44°53'34", long 94°04'24", in SE¼SE¼ sec.33, T.117 N., R.27 W., McLeod County, at culvert on County Highway 63, 1.7 miles northwest of Lester Prairie, and 3.3 miles above mouth.	1.54	1962-70	4-19-70	8.17	27
05278850	Buffalo Creek tributary near Brownton, Minn.	Lat 44°45'55", long 94°22'33", in NE¼SE¼ sec.13, T.115 N., R.30 W., McLeod County, at culvert on State Highway 15, 0.6 mile above mouth, and 2.6 miles northwest of Brownton.	9.45	1961-70	-	(f)	<17
05279030	South Fork Crow River tributary near Mayer, Minn.	Lat 44°54'21", long 93°53'51", in NW¼NE¼ sec.36, T.117 N., R.26 W., Carver County, at culvert on State Highway 7, 0.7 mile above mouth, and 1.4 miles north of Mayer.	7.74	1962-70	5-22-62 3-24-63 3-29-67 7-14-68 4- 7-69 6-16-70	5.91 b5.84 6.54 5.92 6.04 4.67	a95 a57 a167 a96 a108 21
05280300	School Lake Creek tributary near St. Michael, Minn.	Lat 45°12'09", long 93°41'31", in NW¼SE¼ sec.15, T.120 N., R.24 W., Wright County, at culvert on county highway, 0.2 mile above mouth, and 1.5 miles southwest of St. Michael.	2.04	1964-70	3- 7-68 4- 7-69 6-16-70	b8.20 9.23 7.49	a15 61 21
		Rum River basin					
05284100	Mille Lacs Lake tributary near Wealthwood, Minn.	Lat 46°21'25", long 93°41'40", in NW¼NE¼ sec.25, T.45 N., R.27 W., Aitkin County, at culvert on State Highway 18, 0.2 mile above mouth, and 2.0 miles west of Wealthwood.	-	1961-70	4-19-70	7.94	4.8
05284600	Robinson Brook near Onamia, Minn.	Lat 45°58'20", long 93°39'30", in NE¼SE¼ sec.11, T.40 N., R.27 W., Mille Lacs County, at culvert on U.S. Highway 169, a quarter mile above mouth, and 6 3/4 miles south of Onamia.	7.21	1960-70	4-19-70	15.13	119
05284620	Rum River tributary near Onamia, Minn.	Lat 45°57'20", long 93°39'30", in E½ sec.14, T.40 N., R.27 W., Mille Lacs County, at culvert on U.S. Highway 169, a quarter mile above mouth, and 7 3/4 miles south of Onamia.	1.84	1960-70	4-19-70	8.06	45
05284920	Stanchfield Creek tributary near Day, Minn.	Lat 45°41'29", long 93°23'45", in NW¼SE¼ sec.13, T.37 N., R.25 W., Isanti County, at culvert on County Highway 60, 0.5 mile above mouth, and 1.5 miles southwest of Day.	1.26	1961-70	4-19-70	4.71	d2
		Minnesota River basin					
05299100	Lazarus Creek tributary near Canby, Minn.	Lat 44°43'04", long 96°19'42", in NE¼NW¼ sec.6, T.114 N., R.45 W., Yellow Medicine County, at culvert on State Highway 68, 2.7 miles west of Canby, and 4.2 miles above mouth.	2.97	1960-70	6-16-70	g14.92	486
05301200	Minnesota River tributary near Montevideo, Minn.	Lat 44°56'10", long 95°48'10", in SW¼SE¼ sec.16, T.117 N., R.41 W., Lac qui Parle County, at culvert on U.S. Highway 212, 1 mile above mouth, and 3 3/4 miles west of Montevideo.	.54	1960-70	6-15-70	10.57	58
05302970	Lake Emily tributary near Starbuck, Minn.	Lat 45°31'30", long 95°33'40", in NW¼ sec.27, T.124 N., R.39 W., Pope County, at culvert on State Highway 29, 6¾ miles south of Starbuck.	.13	1962-70	5-29-70	8.14	19

< Less than.
a Not previously published.
b Backwater from ice.
d Estimated.
f Peak stage did not reach bottom of gage.
g Backwater from aquatic growth.

Annual maximum discharge at crest-stage partial-record stations during water year 1970--Continued

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
		Minnesota River basin--Continued					
05303450	Hassel Creek near Clontarf, Minn.	Lat 45°24'05", long 95°34'15", in NW¼SE¼ sec.4, T.122 N., R.39 W., Swift County, at culvert on State Highway 29, a quarter mile above Lake Hassel, and 5¾ miles east of Clontarf.	4.03	1962-70	4-28-70	9.57	76
*05305200	Spring Creek near Montevideo, Minn.	Lat 44°58'40", long 95°43'00", in SW¼SW¼ sec.32, T.118 N., R.40 W., Chippewa County, at culvert on State Highway 29, 1¼ miles above mouth, and 2¾ miles north of Montevideo.	16.3	1959-70	6-16-70	13.75	86
05311200	North Branch Yellow Medicine River near Ivanhoe, Minn.	Lat 44°27'32", long 96°21'27", in NE¼NW¼ sec.2, T.111 N., R.46 W., Lincoln County, at culvert on State Highway 19, 5.3 miles west of Ivanhoe.	14.8	1960-70	6-16-70	14.63	158
05311250	North Branch Yellow Medicine River tributary near Wilno, Minn.	Lat 44°33'12", long 96°16'33", in SE¼NE¼ sec.33, T.113 N., R.45 W., Lincoln County, at culvert on U.S. Highway 75, 2.1 miles above mouth, and 4.3 miles northwest of Wilno.	.33	1960-70	6-16-70	9.22	28
05311300	North Branch Yellow Medicine River tributary No. 2 near Porter, Minn.	Lat 44°35'39", long 96°16'34", in SE¼NE¼ sec.16, T.113 N., R.45 W., Lincoln County, at culvert on U.S. Highway 75, 6¾ miles southwest of Porter.	3.70	1960-70	6-16-70	15.15	78
05313800	Chetomba Creek tributary near Blomkest, Minn.	Lat 44°58'40", long 95°02'20", in SW¼SW¼ sec.35, T.118 N., R.35 W., Kandiyohi County, at culvert on U.S. Highway 71, 2 3/4 miles northwest of Blomkest.	.79	1959-70	4- 2-60	7.26	a51
					5- 5-61	5.86	a8.6
					4-17-62	b8.71	a49
					6- 5-63	8.52	a74
					4-13-64	7.79	a70
					5-15-65	c7.78	a69
					3-11-66	b9.92	a26
					6-16-70	8.94	23
05314900	Redwood River at Ruthton, Minn.	Lat 44°10'53", long 96°06'07", in NW¼NW¼ sec.11, T.108 N., R.44 W., Pipestone County, at culvert on State Highway 23, 0.3 mile north of Ruthton.	5.90	1959-70	6-16-70	14.55	191
05315200	Prairie Ravine near Marshall, Minn.	Lat 44°29'44", long 95°47'48", in SE¼NE¼ sec.20, T.112 N., R.41 W., Lyon County, at culvert on U.S. Highway 59, 2.7 miles north of Marshall.	5.63	1959-64≠, 1965-70	4-13-70	5.75	23
05316550	West Fork Beaver Creek near Olivia, Minn.	Lat 44°50'55", long 95°02'05", in SW¼SW¼ sec.14, T.116 N., R.35 W., Renville County, at culvert on U.S. Highway 71, 5½ miles northwest of Olivia.	9.71	1959-70	7-13-70	8.34	243
05316690	Spring Creek tributary near Sleepy Eye, Minn.	Lat 44°23'54", long 94°45'35", in NW¼ sec.25, T.111 N., R.33 W., Brown County, at culvert on county highway, 0.1 mile above mouth, and 7½ miles north of Sleepy Eye.	-	1966-70	4- 5-70	b5.02	21
05316700	Spring Creek near Sleepy Eye, Minn.	Lat 44°24'15", long 94°44'55", in NE¼SE¼ sec.24, T.111 N., R.33 W., Brown County, at culvert on county highway, 3 3/4 miles above mouth, and 7½ miles north of Sleepy Eye.	30.0	1959-70	4- 5-70	9.83	83
05316800	Cottonwood River tributary near Balaton, Minn.	Lat 44°14'20", long 95°57'20", in NW¼NW¼ sec.19, T.109 N., R.42 W., Lyon County, at culvert on U.S. Highway 14, 4¾ miles west of Balaton.	.50	1959-70	6-16-70	5.47	23
05316850	Meadow Creek tributary near Marshall, Minn.	Lat 44°22'42", long 95°45'20", in SE¼NE¼ sec.34, T.111 N., R.41 W., Lyon County, at culvert on U.S. Highway 59, 1.2 miles above mouth, and 4.5 miles south of Marshall.	.54	1961-70	4- 5-70	13.89	14
05316900	Dry Creek near Jeffers, Minn.	Lat 44°07'21", long 95°12'13", in NE¼NE¼ sec.31, T.108 N., R.36 W., Cottonwood County, at culvert on County Highway 10, 4.5 miles north of Jeffers.	3.13	1961-70	6-16-70	6.87	188
05316920	Cottonwood River tributary near Sanborn, Minn.	Lat 44°10'34", long 95°07'15", in SW¼NW¼ sec.12, T.108 N., R.36 W., Cottonwood County, at culvert on U.S. Highway 71, 2.4 miles south of Sanborn.	.42	1966-70	6-16-70	g5.48	44
05317850	Foster Creek near Alden, Minn.	Lat 43°39'31", long 93°35'30", in NE¼NE¼ sec.9, T.102 N., R.23 W., Freeborn County, at culvert on U.S. Highway 16, 1.2 miles southwest of Alden.	2.26	1959-70	5-14-70	5.02	39

* Also a low-flow partial-record station.
≠ Operated as a continuous-record gaging station.
a Not previously published.
b Backwater from ice.
c Revised.
g Backwater from aquatic growth.

Annual maximum discharge at crest-stage partial-record stations during water year 1970--Continued

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
		Minnesota River basin--Continued					
05318100	East Branch Blue Earth River tributary near Blue Earth, Minn.	Lat 43°37'09", long 94°01'03", in SW¼SE¼ sec.24, T.102 N., R.27 W., Faribault County, at culvert on County Highway 13, 0.5 mile above mouth, and 4.3 miles east of Blue Earth.	9.20	1960-70	5-14-70	3.30	35
05318300	North Fork Watonwan River near Delft, Minn.	Lat 44°00'00", long 95°07'20", in E½ sec.11, T.106 N., R.36 W., Cottonwood County, at culvert on U.S. Highway 71, 1 3/4 miles northwest of Delft.	13.1	1960-70	4- 5-70	b16.28	92
05320200	Le Sueur River tributary near Mankato, Minn.	Lat 44°07'29", long 93°57'33", in SE¼SW¼ sec.28, T.108 N., R.26 W., Blue Earth County, at culvert on State Highway 22, 0.2 mile above mouth, and 1.5 miles southeast of Mankato Airport.	.073	1959-70	5-29-70	20.03	15
05320300	Cobb River tributary near Mapleton, Minn.	Lat 44°01'05", long 93°57'30", in SW¼NE¼ sec.4, T.106 N., R.26 W., Blue Earth County, at culvert on State Highway 22, 1.0 mile above mouth, and 6.3 miles north of Mapleton.	7.25	1959-70	4- 7-70	14.29	60
05320400	Maple River tributary near Mapleton, Minn.	Lat 43°55'18", long 94°01'17", in SE¼SW¼ sec.1, T.105 N., R.27 W., Blue Earth County, at culvert on State Highway 30, 0.9 mile above mouth, and 3.3 miles west of Mapleton.	6.22	1959-70	9-25-70	15.18	(✗)
05320440	Judicial ditch No. 49 near Amboy, Minn.	Lat 43°53'17", long 94°07'38", in NW¼ sec.19, T.105 N., R.27 W., Blue Earth County, at culvert on State Highway 30, 1.6 miles east of Amboy.	18.0	1959-70	6-15-67 6-19-68 10- 9-68 6-16-70	17.85 12.79 c14.90 13.88	a450 a288 a314 133
05330150	Sand Creek tributary near Montgomery, Minn.	Lat 44°25'41", long 93°30'31", in NE¼NE¼ sec.18, T.111 N., R.22 W., Rice County, at culvert on State Highway 21, 3½ miles east of Montgomery.	.36	1961-70	4-20-70	8.87	29
05330200	Rice Lake tributary near Montgomery, Minn.	Lat 44°25'42", long 93°32'10", in NE¼NW¼ sec.13, T.111 N., R.23 W., Le Sueur County, at culvert on State Highway 21, 1.8 miles above Rice Lake, and 2.5 miles east of Montgomery.	3.16	1960-70	4-20-70	6.46	27
05330300	Sand Creek near New Prague, Minn.	Lat 44°32'37", long 93°32'16", in NE¼NW¼ sec.1, T.112 N., R.23 W., Le Sueur County, at culvert on State Highway 13 and 19, 1.9 miles east of New Prague.	62.4	1960-70	4-21-70	10.20	197
05330550	Raven Stream tributary near New Prague, Minn.	Lat 44°34'21", long 93°35'58", in NW¼ sec.28, T.113 N., R.23 W., Scott County, at culvert on county road, 1.6 miles above mouth, and 2.3 miles northwest of New Prague.	22.1	1960-70	4-20-70	10.51	122
05330600	Sand Creek tributary No. 2 near Jordan, Minn.	Lat 44°37'45", long 93°36'33", in NW¼NE¼ sec.5, T.113 N., R.23 W., Scott County, at culvert on State Highway 21, 0.8 mile above mouth, and 2.8 miles south of Jordan.	2.62	1960-70	7- 1-61 5-23-62 3-23-63 1964 4- 7-65 4- 1-66 3-24-67 7-13-68 3-23-69 4-20-70	13.27 13.02 b12.60 (f) b16.77 13.46 14.35 13.31 13.17 12.77	a72 a51 a21 a<10 a106 a85 a143 a75 a64 37
		St. Croix River basin					
05336300	Moose River tributary at Moose Lake, Minn.	Lat 46°27'17", long 92°47'14", in SE¼NE¼ sec.19, T.46 N., R.19 W., Carlton County, at culvert on State Highway 27, 0.9 mile above mouth, and 1.2 miles west of Moose Lake.	1.23	1960-70	5-25-70	9.71	112
05336550	Wolf Creek tributary near Sandstone, Minn.	Lat 46°09'45", long 92°51'58", in NE¼SE¼ sec.33, T.43 N., R.20 W., Pine County, at culvert on U.S. Highway 61, 0.2 mile above mouth, and 2.2 miles north of Sandstone.	5.46	1960-70	4-19-70	15.57	28
05336600	Kettle River tributary at Sandstone, Minn.	Lat 46°08'46", long 92°51'57", in SE¼SE¼ sec.4, T.42 N., R.20 W., Pine County, at culvert on U.S. Highway 61 at Sandstone, and 0.2 mile above mouth.	.65	1960-70	4-19-70	7.63	21

< Less than.
✗ Discharge not determined.
a Not previously published.
b Backwater from ice.
c Revised.
f Peak stage did not reach bottom of gage.

Annual maximum discharge at crest-stage partial-record stations during water year 1970--Continued

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
		St. Croix River basin--Continued					
05338200	Mission Creek near Hinckley, Minn.	Lat 45°59'52", long 92°56'44", in SW¼SW¼ sec.25, T.41 N., R.21 W., Pine County, at culvert on U.S. Highway 23, 1.2 miles south of Hinckley.	-	1960-70	4-19-70	15.15	158
		Vermillion River basin					
05345900	Vermillion River tributary near Hastings, Minn.	Lat 44°43'19", long 92°56'03", in NE¼SE¼ sec.35, T.115 N., R.18 W., Dakota County, at culvert on county highway, 2.0 miles above mouth, and 4.1 miles west of Hastings.	14.3	1960-70	3- 3-70	b15.7	<6
		Cannon River basin					
05352700	Turtle Creek tributary No. 2 near Pratt, Minn.	Lat 44°00'02", long 93°08'30", in NW¼SW¼ sec.8, T.106 N., R.19 W., Steele County, at culvert on U.S. Highway 218, 1 mile above mouth, and 1.7 miles southeast of Pratt.	1.28	1960-70	5-14-70	16.97	81
05352800	Turtle Creek tributary near Steele Center, Minn.	Lat 44°00'26", long 93°12'20", in NW¼NW¼ sec.11, T.106 N., R.20 W., Steele County, at culvert on township road, 1.3 miles above mouth, and 1.6 miles northeast of Steele Center.	5.01	1960-70	7-29-70	5.40	45
05355100	Little Cannon River tributary near Kenyon, Minn.	Lat 44°20'50", long 92°58'50", in SE¼ sec.9, T.110 N., R.18 W., Goodhue County, at culvert on State Highway 56, a quarter mile above mouth, and 5 miles north of Kenyon.	2.02	1960-70	5-30-70	12.83	128
05355150	Pine Creek near Cannon Falls, Minn.	Lat 44°32'27", long 92°53'40", in NE¼NE¼ sec.6, T.112 N., R.17 W., Goodhue County, at culvert on State Highway 20, 2.0 miles above mouth, and 2.1 miles north of Cannon Falls.	20.2	1960-70	5-28-70	2.24	81
05355230	Cannon River tributary near Welch, Minn.	Lat 44°36'04", long 92°42'34", in SW¼SW¼ sec.11, T.113 N., R.16 W., Goodhue County, at culvert on U.S. Highway 61, 1.2 miles above mouth, and 2.7 miles northeast of Welch.	.05	1960-70	6-13-70	9.87	42
		Zumbro River basin					
05373350	Zumbro River tributary near South Troy, Minn.	Lat 44°11'16", long 92°25'22", in SE¼NE¼ sec.6, T.108 N., R.13 W., Olmsted County, at culvert on county road, 0.8 mile above mouth, and 1.3 miles south of South Troy.	.16	1962-70	6-15-70	9.87	65
05373700	North Fork Zumbro River tributary near Wanamingo, Minn.	Lat 44°17'10", long 92°52'20", in SE¼SE¼ sec.32, T.110 N., R.17 W., Goodhue County, at culvert on County Highway 1, 3¾ miles above mouth, and 4¾ miles southwest of Wanamingo.	9.36	1960-70	4-20-70	9.43	123
05373900	Trout Brook tributary near Goodhue, Minn.	Lat 44°21'40", long 92°37'00", in SE¼ sec.4, T.110 N., R.15 W., Goodhue County, at culvert on State Highway 58, three-quarter mile above mouth, and 3 miles south of Goodhue.	.41	1960-70	5-28-70	13.84	592
05374400	Long Creek near Potsdam, Minn.	Lat 44°10'48", long 92°17'23", at quarter corner on north line of sec.8, T.108 N., R.12 W., Wabasha County, at culvert on county highway, 2.6 miles northeast of Potsdam.	-	1966-70	6-15-70	16.11	151
		East Indian Creek basin					
05375800	East Indian Creek tributary near Weaver, Minn.	Lat 44°13'41", long 91°58'35", in NW¼SE¼ sec.23, T.109 N., R.10 W., Wabasha County, at culvert on County Highway 14, 0.3 mile above mouth, and 2.5 miles northwest of Weaver.	.21	1962-70	8-29-70	8.90	7.6
		Garvin Brook basin					
05378290	Straight Valley Creek near Altura, Minn.	Lat 44°05'39", long 91°53'07", in SW¼SE¼ sec.3, T.107 N., R.9 W., Winona County, at culvert on State Highway 248, 2.4 miles above mouth, and 3.1 miles northeast of Altura.	-	1966-70	8-29-70	12.31	(≠)

< Less than.
≠ Discharge not determined.
b Backwater from ice.

Annual maximum discharge at crest-stage partial-record stations during water year 1970--Continued

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
		Garvin Brook basin--Continued					
05378300	Straight Valley Creek near Rollingstone, Minn.	Lat 44°05'09", long 91°50'34", in SE¼NE¼ sec.12, T.107 N., R.9 W., Winona County, at bridge on county highway, 0.2 mile above mouth, and 1.5 miles southwest of Rollingstone.	5.16	1959-70h	8-29-70	11.61	(✗)
		Root River basin					
05383600	North Branch Root River tributary near Stewartville, Minn.	Lat 43°51'20", long 92°26'50", near center sec.36, T.105 N., R.14 W., Olmsted County, at culvert on State Highway 30, 2.0 miles east of Stewartville, and 2.3 miles above mouth.	.73	1958, 1959-64✱, 1965-70	9- 8-70	6.77	49
05383700	Mill Creek tributary near Chatfield, Minn.	Lat 43°53'57", long 92°14'16", in SW¼NW¼ sec.14, T.105 N., R.12 W., Olmsted County, at culvert on county highway, 0.8 mile above mouth, and 4.5 miles northwest of Chatfield.	2.36	1959-70	6-17-70	13.67	(✗)
05383720	Mill Creek near Chatfield, Minn.	Lat 43°53'01", long 92°13'46", in SE¼NW¼ sec.23, T.105 N., R.12 W., Olmsted County, at bridge on county highway, 3.4 miles northwest of Chatfield, and 4.8 miles above mouth.	22.4	1962-70	6-17-70	10.83	555
05383850	Bear Creek near Grand Meadow, Minn.	Lat 43°43'25", long 92°35'20", in NE¼SE¼ sec.14, T.103 N., R.15 W., Mower County, at bridge on county highway, 1½ miles northwest of Grand Meadow, and 4 miles above North Fork Bear Creek.	13.6	1962-70	5-14-70	15.14	128
05384100	Duschee Creek near Lanesboro, Minn.	Lat 43°39'40", long 91°58'10", in SW¼SW¼ sec.6, T.102 N., R.9 W., Fillmore County, at culvert on county highway, 7.4 miles above mouth, and 4 miles south of Lanesboro.	3.85	1959-70	6-13-70	12.36	47
05384150	Root River tributary near Whalan, Minn.	Lat 43°43'03", long 91°56'39", in SE¼SW¼ sec.17, T.103 N., R.9 W., Fillmore County, at culvert on private road, 1.3 miles southwest of Whalan.	.08	1959-70	6-13-70	7.40	26
05384200	Gribben Creek near Whalan, Minn.	Lat 43°42'26", long 91°54'50", in NE¼SE¼ sec.21, T.103 N., R.9 W., Fillmore County, at bridge on county highway, 1 3/4 miles southeast of Whalan, and 2¾ miles above mouth.	7.80	1959-70	9-10-70	14.61	182
05384300	Big Springs Creek near Arendahl, Minn.	Lat 43°49'26", long 91°57'00", in NE¼SE¼ sec.7, T.104 N., R.9 W., Fillmore County, at culvert on State Highway 250, 2.0 miles west of Arendahl.	.14	1959-70	6-18-70	8.13	7.6
05384400	Pine Creek near Arendahl, Minn.	Lat 43°50'27", long 91°53'39", in SE¼NE¼ sec.3, T.104 N., R.9 W., Fillmore County, at bridge on County Highway 25, 1.3 miles northeast of Arendahl, and 4.9 miles above Hemingway Creek.	28.1	1959-70	6-18-70	12.45	652
		Iowa River basin					
05457080	Rose Creek tributary near Dexter, Minn.	Lat 43°42'10", long 92°44'30", in SE¼SW¼ sec.22, T.103 N., R.16 W., Mower County, at culvert on county highway, 1 3/4 miles above mouth, and 2¾ miles southwest of Dexter.	1.20	1962-70	5-13-70	7.50	41
		Des Moines River basin					
05474750	Beaver Creek tributary No. 2 near Slayton, Minn.	Lat 43°59'35", long 95°48'01", in NW¼NW¼ sec.17, T.106 N., R.41 W., Murray County, at culvert on State Highway 30, 2.4 miles west of Slayton, and 3.2 miles above mouth.	4.25	1961-70	4- 5-70	b16.97	47

✗ Discharge not determined.
✱ Operated as a continuous-record gaging station.
b Backwater from ice.
h Discontinued as crest-stage partial-record station; established as a continuous-record station on 10-1-70.

Annual maximum discharge at crest-stage partial-record stations during water year 1970--Continued

Station No.	Station name	Location	Drainage area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Discharge (cfs)
		Des Moines River basin--Continued					
05474760	Beaver Creek tributary above Slayton, Minn.	Lat 43°59'35", long 95°47'12", in NE¼NE¼ sec.17, T.106 N., R.41 W., Murray County, at culvert on State Highway 30, 0.9 mile above mouth, and 1.7 miles west of Slayton.	2.20	1961-70	5-17-61	17.52	a43
					3-28-62	b21.56	a116
					7-27-63	17.91	a56
					5- 3-64	17.13	a31
					5- 9-65	18.12	a63
					3- 3-66	b18.71	a50
					4- 2-67	17.07	a29
					7-30-68	16.87	a23
					4- 7-69	20.14	a137
					4- 5-70	b18.00	12
05475400	Warren Lake tributary near Windom, Minn.	Lat 43°54'05", long 95°07'20", in SE¼NE¼ sec.14, T.105 N., R.36 W., Cottonwood County, at culvert on U.S. Highway 71, a quarter mile above Warren Lake, and 2.4 miles north of Windom.	1.38	1960-70	10- 5-69	4.52	21
05475800	Des Moines River tributary near Jackson, Minn.	Lat 43°41'40", long 95°01'30", in NW¼SE¼ sec.27, T.103 N., R.35 W., Jackson County, at culvert on county highway, three-quarter mile above mouth, and 5½ miles north of Jackson.	1.42	1960-70	7-13-70	14.74	50
05475900	Des Moines River tributary No. 2 near Lakefield, Minn.	Lat 43°40'30", long 95°03'20", in SE¼SE¼ sec.32, T.103 N., R.35 W., Jackson County, at culvert on County Highway 19, 1½ miles above mouth, and 5 3/4 miles east of Lakefield.	4.52	1960-70	4- 5-70	5.67	48
05476010	Nelson Creek at Jackson, Minn.	Lat 43°36'55", long 94°59'35", in NW¼NW¼ sec.25, T.102 N., R.35 W., Jackson County, in flume spillway at intersection of U.S. Highways 16 and 71, at south edge of Jackson.	6.8	1959, 1964-70	1970	(f)	<120
05476100	Story Brook near Petersburg, Minn.	Lat 43°32'20", long 94°59'40", in SW¼NW¼ sec.24, T.101 N., R.35 W., Jackson County, at bridge on U.S. Highway 71, 3 miles above mouth, and 4 miles west of Petersburg.	25.2	1960-70	5-14-70	8.97	398
05476900	East Fork Des Moines River tributary near Dunnell, Minn.	Lat 43°35'00", long 94°46'25", in SW¼NW¼ sec.2, T.101 N., R.33 W., Martin County, at bridge on State Highway 4, a half mile above mouth, and 1½ miles north of Dunnell.	7.88	1960-70	5-14-70	13.26	345
		Big Sioux River basin					
06482950	Mound Creek near Hardwick, Minn.	Lat 43°48'18", long 96°12'47", in SE¼SE¼ sec.15, T.104 N., R.45 W., Rock County, at culvert on county highway, 2.2 miles northwest of Hardwick.	2.47	1959-70	4- 5-70	7.79	29
06482960	Mound Creek tributary at Hardwick, Minn.	Lat 43°46'05", long 96°12'44", in NE¼SE¼ sec.34, T.104 N., R.45 W., Rock County, at culvert on U.S. Highway 75, 0.7 mile above mouth, and 0.9 mile southwest of Hardwick.	.19	1959-70	5-28-59	10.07	260
					4- 4-60	7.18	a60
					7- 1-61	6.72	a38
					7- 2-62	7.25	a63
					1963	(f)	<2
					9- 7-64	7.42	a70
					4- 6-65	b10.08	a172
					2- 9-66	b7.82	a66
					6-19-67	6.47	a23
					4- 3-68	6.22	a9.2
					6-29-69	11.08	382
					6-16-70	6.15	6.6
06483050	Rock River tributary near Luverne, Minn.	Lat 43°34'15", long 96°12'45", in NE¼NE¼ sec.10, T.101 N., R.45 W., Rock County, at culvert on U.S. Highway 75, 5.8 miles south of Luverne.	.21	1959-70	5-30-59	15.19	180
					7-17-60	14.24	a107
					3-14-61	b13.50	a11
					7- 2-62	14.82	a152
					7-27-63	12.93	a3.8
					7-11-64	13.23	a22
					4- 6-65	b15.78	a163
					2- 9-66	b13.68	a18
					6-19-67	13.38	a36
					1968	(f)	c<3
					4- 6-69	13.30	a28
					5-28-70	13.24	23

< Less than.
a Not previously published.
b Backwater from ice.
c Revised.
f Peak stage did not reach bottom of gage.

Annual maximum discharge at crest-stage partial-record stations during water year 1970--Continued

Station No.	Station name	Location	Drainaga area (sq mi)	Period of record	Annual maximum		
					Date	Gage height (feet)	Dis-charge (cfs)
		Big Sioux River basin--Continued					
06483200	Kanaranzi Creek tributary near Lismore, Minn.	Lat 43°45'41", long 95°55'56", in SW¼SW¼ sec.31, T.104 N., R.42 W., Nobles County, at culvert on county highway adjacent to State Highway 91, 60 ft above mouth, and 1.2 miles northeast of Lismore.	.14	1959-70	6-16-70	17.53	46
06483210	Kanaranzi Creek tributary No. 2 near Wilmont, Minn.	Lat 43°43'32", long 95°52'20", in SW¼NW¼ sec.15, T.103 N., R.42 W., Nobles County, at culvert on County Highway 15, 3.5 miles southwest of Wilmont, and 3.7 miles above mouth.	2.14	1966-70	4- 5-70	5.82	135
		Little Sioux River basin					
06603520	Judicial ditch 28 tributary near Spafford, Minn.	Lat 43°36'58", long 95°22'58", in NW¼NE¼ sec.27, T.102 N., R.38 W., Jackson County, at culvert on U.S. Highway 16, 0.4 mile west of Spafford, and 0.6 mile above mouth.	4.06	1959-70	8- 7-70	6.95	21
*06603530	Little Sioux River near Spafford, Minn.	Lat 43°36'08", long 95°15'27", in NE¼NE¼ sec.34, T.102 N., R.37 W., Jackson County, at bridge on county highway, 1.6 miles below Jackson County ditch No. 11, and 5.8 miles east of Spafford.	-	1962-70	4- 5-70	b7.70	70

* Also a low-flow partial-record station.
b Backwater from ice.

Discharge measurements at miscellaneous sites

Measurements of streamflow at points other than gaging stations are given in the following table. Those that are measurements of base flow are designated by an asterisk (*); measurements of peak flow by a dagger (†).

Discharge measurements made at miscellaneous sites during water year 1970

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
		Red River of the North basin				
Campbell Creek	Pelican River	Lat 46°53'29", long 95°51'57", on line between sec.4, T.139 N., R.41 W., and sec.33, T.140 N., R.41 W., Becker County, at upstream side of 36-inch corrugated metal pipe culvert on county road, 5.3 miles north of Detroit Lakes, Minn.	-	1969	10- 9-69	.16
					11-13-69	1.21
					12-15-69	*.11
					1-19-70	0
					2-24-70	0
					3-30-70	a.01
					4- 8-70	6.30
					4-27-70	15.1
					6- 2-70	*1.95
					6-30-70	5.21
					8- 3-70	0
					8-30-70	0
Floyd Lake Outlet	Pelican River	Lat 46°52'42", long 95°50'23", in SE¼SE¼ sec.3, T.139 N., R.41 W., Becker County, on upstream side of concrete box culvert on County Highway 21, 3.7 miles northeast of Detroit Lakes, Minn.	-	1969	10- 9-69	0
					11-13-69	0
					12-15-69	*.22
					1-19-70	.35
					2-24-70	.17
					3-30-70	.20
					4- 8-70	1.06
					4-27-70	11.0
					6- 2-70	*10.4
					6-30-70	*11.3
					8- 3-70	.19
					8-31-70	0
Pelican River tributary	Pelican River	Lat 46°46'52", long 95°48'01", in SE¼ sec.12, T.138 N., R.41 W., Becker County, at culvert on county road, 100 ft upstream from Detroit Lake, 0.8 mile north of Sucker Creek, and 3.2 miles southeast of Detroit Lakes, Minn.	-	1968-69	10- 9-69	0
					11-13-69	.05
					12-15-69	*.31
					1-19-70	.20
					2-24-70	.24
					3-30-70	.60
					4- 8-70	10.3
					4-27-70	12.3
					6- 1-70	*9.79
					6-25-70	0
Sucker Creek	Pelican River	Lat 46°46'25", long 95°48'23", in NW¼ sec.13, T.138 N., R.41 W., Becker County, at culvert on county road, 200 ft upstream from Detroit Lake, and 3.5 miles southeast of Detroit Lakes, Minn.	-	1968-69	10- 9-69	1.50
					11-13-69	1.83
					12-15-69	*1.82
					1-19-70	1.75
					2-24-70	1.67
					3-30-70	1.97
					4- 7-70	11.4
					4-27-70	11.1
					6- 1-70	*3.68
					6-25-70	*2.21
Oxidation Pond Outlet	St. Clair Lake	SE¼NE¼ sec.32, T.139 N., R.41 W., Becker County, at outlet of Oxidation Pond, 1.8 miles west of Detroit Lakes, Minn.	-	1968-69	10- 9-69	1.19
					11-13-69	.97
					12-16-69	1.05
					2-25-70	1.02
					3-31-70	1.05
					4-28-70	1.36
					6- 2-70	1.08
					6-24-70	1.18
					8- 5-70	1.19
					8-17-70	.98
					8-31-70	1.10
					9-23-70	1.34
Pelican River tributary	Pelican River	Lat 46°47'02", long 95°53'07", in NE¼ sec.8, T.138 N., R.41 W., Becker County, at State Fish Hatchery, on left downstream abutment of bridge over outlet from rearing ponds, 1,000 ft north of Muskrat Lake Outlet and 3 miles southwest of Detroit Lakes, Minn.	-	1968-69	10- 9-69	.28
					11-13-69	.26
					12-16-69	*.31
					1-20-70	.28
					2-25-70	.29
					3-31-70	.40
					4- 8-70	.64
					4-28-70	.50
					6- 3-70	*.39
					6-25-70	*.26
					8- 4-70	*.25
					8-31-70	*.26

* Base flow.
a Estimated

Discharge measurements made at miscellaneous sites during water year 1970

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
		Red River of the North basin--Continued				
Monson Lake Outlet	Pelican River	Lat 46°47'15", long 95°53'30", in NW¼ sec.8, T.138 N., R.41 W., Becker County, 50 ft upstream from culvert, 100 ft downstream from Monson Lake, 800 ft upstream from Lake Sallie, and 3 miles southwest of Detroit Lakes, Minn.	-	1968-69	10- 9-69 11-12-69 12-16-69 1-20-70 2-24-70 3-31-70 4- 8-70 4-28-70 6- 3-70 6-25-70 8- 4-70 8-31-70	0 0 0 0 0 0 0 .38 .40 *.07 *.02 0
Fox Lake Outlet	Pelican River	Lat 46°46'24", long 95°54'37", in NE¼ sec.18, T.138 N., R.41 W., Becker County, 500 ft downstream from Fox Lake, 800 ft upstream from Lake Sallie, and 4.5 miles southwest of Detroit Lakes, Minn.	-	1968-69	10- 8-69 11-12-69 12-16-69 1-20-70 2-24-70 3-31-70 4- 8-70 4-28-70 6- 2-70 6-24-70 8- 5-70 8-31-70	0 a.01 0 0 0 1.49 1.61 1.99 1.33 *1.04 *<.01 0
Pelican River	Otter Tail River	NE¼SW¼ sec.31, T.138 N., R.41 W., Becker County, at highway crossing at Buck's Mill, 6.5 miles southwest of city of Detroit Lakes, Minn.	123	1942-52≠ 1968-69	12-16-69 3-31-70 4- 9-70 4-28-70 6- 2-70 6-26-70 9-23-70	10.6 25.5 27.8 91.4 77.4 84.4 .18
West Fork Twelvemile Creek	Twelvemile Creek	On line between secs. 28 and 33, T.126 N., R.45 W., Traverse County, 1 mile upstream from mouth, and 4.4 miles southeast of Dumont, Minn.	-	1964-65	5-14-70	0
Wild Rice River	Red River of the North	On line between sec.13, T.144 N., R.46 W., and sec.18, T.144 N., R.45 W., Norman County, at bridge on County Highway 24, 0.3 mile south of State Highway 31, and 3.2 miles southeast of Ada, Minn.	-	1945-51, 1965-69	4-10-70 4-23-70 6-18-70	1,490 1,010 2,000
South Branch Wild Rice River	Wild Rice River	On line between secs.8 and 9, T.142 N., R.45 W., Clay County, at bridge on County Highway 63, 5.5 miles northeast of Felton, Minn.	b180	1959-69	4- 8-70 6-18-70	434 342
State ditch No. 45	Wild Rice River	On line between secs.15 and 16, T.141 N. R.46 W., Clay County, at culvert on State Highway 9, 3 miles south of Felton, Minn.	b45	1959-69	6-18-70	64.5
Red Lake River	Red River of the North	Lat 47°55'24", long 97°00'59", in SW¼SW¼ sec.1, T.15 N., R.49 W., Polk County, at bridge on State Highway 220 in East Grand Forks, Minn., 0.3 mile upstream from mouth.	b5,660	1903, 1906, 1908, 1910-11, 1918, 1964	4-16-70 6-24-70 8-19-70 9-16-70	8,760 5,290 869 969
Two Rivers	Red River of the North	Lat 48°46'30", long 96°55'52", in SE¼SE¼ sec.12, T.161 N., R.49 W., Kittson County, at bridge on County Highway 3, at east edge of Hallock, and 0.25 mile downstream from South Branch.	625	1911-14≠ 1929-30≠ 1941-43≠ 1967-69	4-13-69 4-15-69 4-21-69 4-23-70 6-23-70	2,900 3,680 1,520 1,660 2,010
Roseau River	Red River of the North	SW¼ sec.13, T.162 N., R.40 W., Roseau County, at bridge on State Highway 11, at Roseau, Minn.	-	1911-14, 1943, 1967-69	4-25-70 4-30-70	2,020 2,610

* Base flow.
≠ Operated as a continuous-record gaging station.
< Less than.
a Estimated.
b Approximately.

Discharge measurements made at miscellaneous sites during water year 1970

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
		Lake of the Woods basin				
Shagawa Lake tributary	Shagawa Lake	NE¼SW¼ sec.28, T.63 N., R.12 W., St. Louis County, downstream from sewage disposal plant at Ely, Minn.	-	1969	4-28-70 5-22-70 6-10-70 8-20-70 9-23-70	1.02 2.91 19.7 *.12 *.42
Shagawa Lake tributary	Shagawa Lake	NW¼SE¼ sec.20, T.63 N., R.12 W., St. Louis County, on County Highway 88, 2 miles northwest of Ely, Minn.	-	1969	11- 3-69 4-14-70 4-27-70 5-22-70 6-10-70 8-20-70 9-24-70	1.56 4.65 26.9 20.1 60.3 0 3.27
Little Fork River	Rainy River	SE¼NE¼ sec.13, T.62 N., R.19 W., St. Louis County, at bridge on U.S. Highway 53, 0.6 mile west of Cook, Minn.	-	1950, 1958-69	11- 6-69 4-28-70 6-11-70	76.6 558 1,840
Big Fork River	Rainy River	Sec.12, T.149 N., R.27 W., Itasca County, at bridge on County Highway 29, at Dora Lake, Minn.	-	1965-69	10- 2-69 11- 6-69 3-18-70 5- 5-70 5-19-70 7- 9-70 8- 7-70	189 527 146 904 925 266 *112
Warroad River	Lake of the Woods	SW¼SE¼ sec.29, T.162 N., R.36 W., Roseau County, at bridge on State Highway 11, in Warroad, Minn.	b256	1968-69	4-27-70	1,410
		Mississippi River main stem				
Mississippi River	Gulf of Mexico	N½ sec.13, T.155 N., R.26 W., Itasca County, at dam at outlet of Pokegama Lake, 3.5 miles northwest of Grand Rapids, Minn.	3,265	1929-30, 1944-45, 1948-55, 1957-69	11-12-69 12-29-69 7-31-70 9-22-70	1,760 1,830 538 285
		Prairie River basin				
Prairie River	Mississippi River	Lat 47°13'59", long 93°29'15", in NW¼SW¼ sec.14, T.55 N., R.25 W., Itasca County, at bridge on U.S. Highway 169, 0.5 mile northeast of Grand Rapids, Minn.	-	-	8-14-70	70.8
		Crow Wing River basin				
Little Sand Lake Outlet	Crow Wing River	NE¼ sec.36, T.141 N., R.34 W., Hubbard County, 0.5 mile downstream from Little Sand Lake, and 3 miles northeast of Dorset.	a74	1930-41≠, 1942, 1956-69	10-27-69 12- 1-69 1-26-70 2-16-70 3-16-70 4-21-70 5- 8-70 6-26-70 7-27-70 8-31-70	32.4 28.1 31.8 31.4 38.8 41.6 45.3 43.0 31.1 12.4
Partridge River	Crow Wing River	SW¼NW¼ sec.25, T.134 N., R.34 W., Wadena County, at bridge on County Highway 2, 1 mile northeast of Aldrich, Minn.	-	1967-68	7- 7-70	*3.51
Partridge River	Crow Wing River	SE¼SE¼ sec.19, T.134 N., R.33 W., Wadena County, at bridge on County Highway 114, 3 miles northeast of Aldrich, Minn.	-	1967-68	7- 7-70	*10.0
		Elk River basin				
St. Francis River	Elk River	SW¼NW¼ sec.27, T.35 N., R.27 W., Sherburne County, at bridge on County Highway 9, about 1 mile upstream from Rice Lake, and 4.2 miles northeast of Orrock, Minn.	-	1969	5-19-70	*42.2

* Base flow.
≠ Operated as a continuous-record gaging station.
a Estimated.
b Approximately.

Discharge measurements made at miscellaneous sites during water year 1970

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
		Elk River basin--Continued				
St. Francis River tributary	St. Francis River	On line between secs.2 and 3, T.34 N., R.27 W., Sherburne County, at culvert on County Highway 43, 0.4 mile upstream from mouth and 3.5 miles northeast of Orrock, Minn.	-	1969	5-19-70	*3.49
Battle Brook	St. Francis River	SE¼SE¼ sec.19, T.35 N., R.26 W., Sherburne County, at culvert on County Highway 9, 0.5 mile upstream from Elk Lake, and 4.4 miles northwest of Lake Fremont, Minn.	-	1969	5-19-70	*6.24
Battle Brook	St. Francis River	NW¼SW¼ sec.31, T.35 N., R.26 W., Sherburne County, at outlet of Elk Lake, 2.7 miles northwest of Zimmerman, Minn.	-	1963, 1965-69	10-15-69 11-20-69 12-16-69 1-20-70 2-24-70 3-31-70 5- 4-70 6- 9-70 7-14-70 8-28-70	9.52 *8.84 *12.5 *8.64 *7.73 9.17 *15.9 *6.36 9.00 *4.33
		Crow River basin				
Twelvemile Creek	North Fork Crow River	On line between secs.20 and 29, T.119 N., R.26 W., Wright County, at County Highway 107, 2 miles north of Waverly, Minn.	-	1942-44, 1969	5-20-70	0
Middle Fork Crow River tributary	Middle Fork Crow River	On line between secs.28 and 29, T.122 N., R.34 W., Kandiyohi County, at bridge on graveled road, 0.4 mile upstream from mouth, and 3.8 miles northwest of New London, Minn.	-	-	12- 3-69	*1.91
		Rum River basin				
Rum River	Mississippi River	SW¼ sec.33, T.43 N., R.27 W., Mille Lacs County, at bridge on U.S. Highway 169, at Mille Lacs Lake outlet, at Vineland, Minn.	a378	1909-10, 1945-47, 1952-53, 1965, 1969	8-27-70	*83.2
Bogus Brook	Rum River	SW¼SW¼ sec.23, T.37 N., R.26 W., Mille Lacs County, at bridge on County Highway 1, 0.2 mile upstream from mouth and 1.6 miles east of Woodward Brook, Minn.	-	1969	5-20-70	*2.56
Rum River	Mississippi River	SE¼ sec.28, T.36 N., R.26 W., Mille Lacs County, at bridge on State Highway 95, 0.2 mile upstream from West Branch Rum River, and at Princeton, Minn.	-	1961, 1965	8-27-70	*82.1
		Elm Creek basin				
Elm Creek	Mississippi River	Lat 45°11'04", long 93°24'06", on line between sec.19, T.120 N., R.21 W., and sec.24, T.120 N., R.22 W., Hennepin County, at bridge on Cartway Road, at south edge of Champlin, Minn.	-	1969	10-27-69 12- 4-69 1-12-70 2-24-70 4- 2-70 5- 8-70 6- 5-70 7- 8-70 8-11-70 9-17-70	*9.12 *3.87 *2.40 *4.60 6.80 19.5 10.7 *3.35 4.34 4.54

* Base flow.
a Estimated.

Discharge measurements made at miscellaneous sites during water year 1970

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
		Coon Creek basin				
Coon Creek	Mississippi River	Lat 45°09'00", long 93°17'49", in NW¼NE¼ sec.26, T.31 N., R.24 W., Anoka County, at bridge on Coon Rapids Boulevard, at southeast edge of Coon Rapids, Minn.	-	1932-34, 1936, 1941, 1955-56, 1969	10-27-69 12- 4-69 1-12-70 2-24-70 4- 2-70 5- 8-70 6- 5-70 7- 8-70 8-11-70 9-17-70	*13.2 *24.3 *25.0 *4.88 34.0 *48.6 *42.0 *20.7 *16.8 20.7
		Rice Creek basin				
Rice Creek	Mississippi River	Lat 45°05'30", long 93°15'47", on line between secs.14 and 15, T.30 N., R.24 W., Anoka County, at culvert on State Highway 47 (University Avenue), at north edge of Fridley, Minn.	-	1969	10-27-69 12- 4-69 1-12-70 2-24-70 4- 2-70 5- 8-70 6- 5-70 7- 8-70 8-11-70 9-17-70	*3.63 *9.63 *10.6 *7.31 16.3 *47.6 *28.0 *5.11 *7.32 12.5
		Shingle Creek basin				
Shingle Creek	Mississippi River	Lat 45°04'45", long 93°18'55", in NE¼NW¼ sec.35, T.119 N., R.21 W., Hennepin County, at bridge on 69th Avenue North in Brooklyn Center, Minn.	-	1969	10-27-69 12- 4-69 1-13-70 2-24-70 4- 2-70 5- 8-70 6- 5-70 7- 8-70 8-11-70 9-17-70	*6.75 *5.92 *5.03 *12.5 9.24 *12.7 *15.3 *5.64 *6.28 8.57
		Bassett Creek basin				
Bassett Creek	Mississippi River	W½ sec.28, T.118 N., R.21 W., Hennepin County, at bridge on County Highway 66 in Golden Valley, Minn., and 0.2 mile west of underpass on State Highway 100.	-	1963-69	10-27-69 5- 7-70 6- 4-70 7- 7-70 8-10-70 9-15-70	*2.39 *25.5 *27.1 *9.35 *9.01 17.3
North Fork Bassett Creek	Bassett Creek	NW¼ sec.21, T.118 N., R.21 W., Hennepin County, at culvert on 34th Avenue North at Crystal, Minn., and 0.8 mile upstream from mouth.	-	1963-69	10-27-69 5- 7-70 6- 4-70 7- 7-70 8-10-70 9-15-70	0 *.67 *1.12 0 *.47 2.99
Bassett Creek	Mississippi River	SE¼ sec.20, T.29 N., R.24 W., Hennepin County, at Fruen Mill, Minneapolis Minn., and 700 feet downstream from Glenwood Avenue.	41.6	1952, 1954-55, 1963-69	10-27-69 5- 7-70 6- 4-70 7- 7-70 8-10-70 9-15-70	*2.52 *3.87 *30.4 *11.7 *10.8 20.9
		Mississippi River main stem				
Mississippi River	Gulf of Mexico	SW¼ sec.24, T.29 N., R.24 W., Hennepin County, at Interstate Highway 35W bridge, at Minneapolis, Minn.	-	1938	4-15-70	18,900
Mississippi River	Gulf of Mexico	In sec.20, T.28 N., R.23 W., Hennepin County, below lock and dam No. 1, between Minneapolis and St. Paul, Minn. and 4 miles upstream from Minnesota River.	19,700	1924, 1935, 1938-39, 1941, 1943, 1945-50, 1954, 1957, 1959, 1961-62, 1964-69	11- 3-69 7-21-70 9- 9-70	4,750 4,250 1,700

* Base flow.

Discharge measurements made at miscellaneous sites during water year 1970

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
		Minnesota River basin				
Chippewa River diversion	Minnesota River	On line between secs.15 and 16, T.118 N., R.41 W., Chippewa County, at weir at bridge on county road, 1 mile north of Watson, Minn.	-	1943-58, 1960-67, 1969	10-28-69 11-25-69 4- 3-70 4- 9-70 5- 8-70 6- 8-70 7- 8-70 8-19-70 9-16-70	70.9 7.03 28.7 298 75.3 0 0 7.27 20.8
Chippewa River	Minnesota River	On line between secs.15 and 22, T.118 N., R.41 W., Chippewa County, downstream from diversion channel, at culvert and spillway at bridge on County Highway 13, 1 mile northeast of Watson, Minn.	b2,050	1910-17≠, 1931-36≠, 1937, 1943-58, 1960-67, 1969	10-28-69 11-25-69 4- 3-70 4- 9-70 5- 8-70 8-19-70 9-16-70	9.20 75.9 125 846 670 47.1 18.0
Coon Creek	Blue Earth River	On line between secs.20 and 29, T.102 N., R.27 W., Faribault County, at bridge on county road, 0.5 mile upstream from mouth, and 1.8 miles south of Blue Earth, Minn.	-	1969	5-19-70	60.6
Badger Creek	Blue Earth River	N½ sec.13, T.102 N., R.28 W., Faribault County, at bridge on county road, 1.3 miles upstream from mouth, and 1.8 miles west of Blue Earth, Minn.	-	1969	5-19-70	82.2
East Branch Blue Earth River	Blue Earth River	Lat 43°38'58", long 94°06'10", in NE¼SW¼ sec.8, T.102 N., R.27 W., Faribault County, at bridge on U.S. Highway 169 in Blue Earth, Minn.	-	1969	5-19-70	209
Lily Creek	Center Creek	On line between sec.31, T.103 N., R.30 W., and sec.36, T.103 N., R.31 W., Martin County, at bridge on County Highway 14, 1 mile upstream from mouth, and 2.3 miles northwest of Fairmont, Minn.	-	1969	5-20-70	47.7
Cedar Creek	Elm Creek	On line between secs.34 and 35, T.104 N., R.32 W., Martin County, at bridge on County Highway 52, 1.3 miles upstream from Creek Lake, and 3 miles east of Trimont, Minn.	-	1969	5-20-70	18.8
Carver Creek	Minnesota River	Lat 44°45'01", long 93°39'00", in SW¼SE¼ sec.24, T.115 N., R.24 W., Carver County, at bridge on County Highway 40, 1.6 miles upstream from mouth, and 1.5 miles southwest of Carver, Minn.	-	1968-69	10-27-69 12- 3-69 1- 9-70 2-20-70 4- 1-70 5- 1-70 6- 3-70 7- 2-70 8- 5-70 9-10-70	*2.61 *1.62 *2.26 *1.71 7.38 31.4 *41.8 6.70 *3.09 2.71
Riley Creek	Minnesota River	Lat 44°49'23", long 93°28'48", on line between secs.28 and 29, T.116 N., R.22 W., Hennepin County, at culvert on County Highway 4, 2.2 miles south of Eden Prairie, Minn.	-	1969	10-27-69 12- 2-69 1- 9-70 2-20-70 4- 1-70 5- 1-70 6- 3-70 7- 2-70 8- 5-70 9-10-70	*.79 *.66 *1.11 *1.11 .83 1.08 *.82 1.42 *1.29 1.14
Purgatory Creek	Minnesota River	Lat 44°49'38", long 93°25'20", in SE¼NE¼ sec.26, T.116 N., R.22 W., Hennepin County, at culvert on County Highway 1, at Eden Prairie, Minn.	-	1968-69	10-27-69 12- 2-69 1- 9-70 2-20-70 4- 1-70 5- 1-70 6- 3-70 7-20-70 8- 5-70 9-10-70	*.61 *2.61 *1.26 *.60 12.3 22.2 *20.7 .86 *3.17 3.00

* Base flow.
≠ Operated as a continuous-record gaging station.
b Approximately.

Discharge measurements made at miscellaneous sites during water year 1970

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
		Mississippi River main stem				
Mississippi River	Gulf of Mexico	At Hastings, Dakota County, Minn.	37,100	1928, 1931-39, 1941-57, 1959-69	4-17-70	24,200
		St. Croix River basin				
Partridge Creek	Sand Creek	On line between secs.10 and 15, T.42 N., R.19 W., Pine County, at culvert on County Highway 30, 6.9 miles east of Sandstone, Minn.	-	-	5-19-70	*4.69
Clover Creek	Sand Creek	SE¼NW¼ sec.19, T.40 N., R.18 W., Pine County, at outlet of Clayton Lake in St. Croix State Park, 15 miles southeast of Hinckley, Minn.	-	1967	5-18-70	*16.4
Chelsey Brook	Snake River	On line between secs.12 and 13, T.42 N., R.23 W., Kanabec County, at bridge on county highway, 5 miles northeast of Woodland, Minn.	-	1967, 1969	5-20-70	*6.2
Mission Creek	Snake River	NW¼NW¼ sec.31, T.39 N., R.21 W., Pine County, at bridge on County Highway 53, 2.5 miles west of Pine City, Minn.	-	1967, 1969	5-19-70	*10.1
Valley Branch	St. Croix River	Lat 44°54'40", long 92°46'48", in NW¼SW¼ sec.14, T.28 N., R.20 W., Washington County, at bridge on State Highway 95, 0.3 mile upstream from mouth, and 0.6 mile north of Afton, Minn.	-	1967, 1969	10-28-69 12- 3-69 1- 8-70 2-19-70 3-26-70 5- 6-70 6- 2-70 7- 6-70 8- 3-70 9-16-70	*8.16 *8.70 *13.7 *8.02 10.9 *10.7 *11.8 *8.52 *9.59 *8.98
St. Croix River	Mississippi River	At Prescott, Pierce County, Wis.	b7,650	1928-30, 1932-39, 1946-48, 1950, 1953-57, 1959-69	4-17-70	13,200
		Vermillion River basin				
Vermillion River	Mississippi River	Lat 44°40'00", long 93°03'17", on line between secs.23 and 24, T.114 N., R.19 W., Dakota County, at bridge on County Highway 79, 2 miles northwest of Empire City, and 3.7 miles southwest of Coates, Minn.	110	1942-45≠, 1969	3-26-70 6- 2-70 7- 3-70 9-11-70	37.8 171 31.6 22.3
Vermillion River	Mississippi River	Lat 44°43'12", long 92°51'57", in SE¼SW¼ sec.33, T.115 N., R.17 W., Dakota County, at bridge on County Highway 47 in Hastings, 0.7 mile upstream from mill dam, and 3 miles upstream from Vermillion Slough.	195	1935-38, 1940-41, 1942-47≠, 1949, 1952, 1965-69	3-26-70 5-28-70 7- 3-70 9-16-70	66.9 145 41.0 33.6
		Cannon River basin				
Cannon River	Mississippi River	SE¼SE¼ sec.18, T.109 N., R.23 W., Le Sueur County, at bridge on County Highway 12, 0.25 mile upstream from Lake Tetonka, and 3.3 miles northwest of Waterville, Minn.	-	-	8-28-70	*1.66
Cannon River	Mississippi River	SW¼NE¼ sec.30, T.110 N., R.20 W., Rice County, at mill dam, 0.1 mile upstream from State Highway 3, 0.3 mile upstream from Straight River, in Faribault, Minn.	-	1965-69	10-17-69 11-21-69 12-18-69 1-27-70 3- 2-70 3-31-70 5- 5-70 6-15-70 7-13-70 8-18-70 8-25-70 9-21-70	50.0 *6.00 *13.5 *17.6 *30.8 22.1 260 197 69.6 *a.5 *18.2 24.6

* Base flow.
≠ Operated as a continuous-record gaging station.
a Estimated.
b Approximately.

Discharge measurements made at miscellaneous sites during water year 1970

Stream	Tributary to	Location	Drainage area (sq mi)	Measurad previously (water years)	Measurements	
					Date	Discharge (cfs)
		Cannon River basin--Continued				
Straight River	Cannon River	Lat 44°05'04", long 93°13'48", at center of SE¼ sec.9, T.107 N., R.20 W., Steele County, at bridge on West Bridge Street in Owatonna, Minn.	-	1961, 1966-69	10-14-69	24.1
					11-14-69	*12.4
					5- 1-70	124
					6-16-70	165
					7-14-70	33.5
					8-18-70	*22.9
					8-27-70	*16.3
					9-22-70	24.9
Crane Creek	Straight River	SE¼NW¼ sec.20, T.108 N., R.20 W., Steele County, at culvert on service road, 1 mile northwest of Clinton Falls, Minn.	-	1965-69	10-15-69	3.50
					11-14-69	*1.89
					12-16-69	*4.95
					1-27-70	*1.76
					3- 3-70	*4.48
					4- 1-70	25.2
					5- 1-70	91.6
					6-12-70	*35.6
					7-14-70	32.7
					8-18-70	*8.49
					8-27-70	*4.62
					9-21-70	11.3
Straight River	Cannon River	Lat 44°18'37", long 93°16'09", NW¼NE¼ sec.30, T.110 N., R.20 W., Rice County, in Faribault, Minn., 200 ft upstream from mouth, and 1700 ft downstream from bridge on 14th St. N.	-	1965	8-27-70	46.9
Cannon River	Mississippi River	NE¼NE¼ sec.19, T.110 N., R.20 W., Rice County, at bridge on county road, 0.7 mile downstream from Straight River, and 1.7 miles north of Faribault, Minn.	-	-	10-15-69	104
Cannon River	Mississippi River	Lat 44°29'17", long 93°07'42" in SW¼SE¼ sec.20, T.112 N., R.19 W., Dakota County, at bridge on county road, 0.7 mile east of Waterford, Minn.	-	-	8-26-70	*116
		Zumbro River basin				
Cold Creek	Zumbro River	SE¼NE¼ sec.36, T.109 N., R.14 W., Wabasha County, at triple box culvert on State Highway 60, 0.2 mile upstream from mouth, and 0.6 mile northwest of Zumbro Falls, Minn.	45.9	1916, 1969	5-28-70	✓19,800
Zumbro River	Mississippi River	NW¼SE¼ sec.22, T.110 N., R.10 W., Wabasha County, at bridge on U.S. Highway 61, at Kellogg, Minn.	b1,400	1932-33, 1935-36, 1938-39, 1945, 1962	8-19-70	*330
		Mississippi River main stem				
Mississippi River	Gulf of Mexico	In sec.8, T.106 N., R.5 W., Trempeleau County, at lock and dam No. 6 at Trempeleau, Wis.	-	1936-37, 1945, 1952	6- 4-70	56,000
					6-11-70	39,300
		Des Moines River basin				
Des Moines River c/	Mississippi River	Near center of sec.20, T.105 N., R.38 W. Cottonwood County, at outlet of Talcot Lake, 3.2 miles northeast of Dundee, Minn.	-	1963-69	10-16-69	5.98
					11-18-69	*11.7
					12-16-69	*8.52
					1-20-70	*5.06
					2-18-70	*3.93
					3-24-70	49.1
					4- 7-70	702
					5-11-70	*124
					6-10-70	*41.3
					7-24-70	*9.48
					8-25-70	*9.39

* Base flow.
✓ Peak flow.
b Approximately.
c Published as West Fork 1963-69.

Low-flow investigations in the Mississippi-Sauk watershed

During the period Aug. 17-20, 1970 a series of streamflow measurements was made in the Mississippi-Sauk watershed to study base-flow yields from various parts of the watershed. There was rain in the basin on Aug. 11-12, and during the night of Aug. 14. Total rainfall amounts from these two storms ranged from 0.6 to 0.8 inch at most of the rainfall reporting stations in the basin. The precipitation caused small increases in flow at several gaging stations in the basin but by Aug. 17 the streams were generally near normal so these measurements should represent base flow.

Discharge measurements made in the Mississippi-Sauk watershed, Minn., Aug. 17-20, 1970

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
Nokasippi River	Mississippi River	NW¼SE¼ sec.27, T.44 N., R.30 W., Crow Wing County, at State Highway 25, 7.8 miles southeast of Brainerd, Minn.	-	1969	8-17-70	2.87
Dagget Brook	Nokasippi River	On line between secs.3 and 10, T.43 N., R.30 W., Crow Wing County, at county road, 9.1 miles southeast of Crow Wing, Minn.	-	1969	8-17-70	.38
Hay Creek	Nokasippi River	SW¼SW¼ sec.9, T.43 N., R.31 W., Crow Wing County, on county highway, 0.1 mile upstream from mouth, and 4.5 miles southeast of Crow Wing, Minn.	-	-	8-17-70	.15
Nokasippi River	Mississippi River	Lat 46°12'02", long 94°19'03", on line between secs.13 and 24, T.43 N., R.32 W., Crow Wing County, at bridge on County Highway 2, 3 miles northeast of Fort Ripley, Minn.	-	1968-69	*8-17-70	10.2
Little Nokasippi River	Nokasippi River	NW¼NE¼ sec.26, T.43 N., R.32 W., Crow Wing County, on county highway, 0.8 mile upstream from mouth, and 1.6 miles northeast of Fort Ripley, Minn.	-	-	8-17-70	0
Fletcher Creek	Mississippi River	At center of W½ sec.1, T.41 N., R.32 W., Morrison County, at box culvert on U.S. Highway 371, 0.2 mile upstream from mouth, and 0.6 mile south of Camp Ripley Junction, Minn.	-	1969	8-17-70	0
Fish Lake Outlet a/	Mississippi River	On line between secs.29 and 30, T.130 N., R.29 W., Morrison County, at box culvert on County Highway 13, 1.9 miles northwest of Belle Prairie, Minn.	-	1969	8-17-70	0
Elk River	Mississippi River	SE¼SW¼ sec.6, T.130 N., R.30 W., Morrison County, on County Highway 6, in Randall, Minn., and 0.8 mile upstream from Little Elk River.	-	-	8-18-70	0
Little Elk River	Elk River	NE¼SE¼ sec.7, T.130 N., R.30 W., Morrison County, on U.S. Highway 10 in Randall, Minn., and 0.2 mile upstream from mouth.	-	-	8-18-70	0
Elk River tributary	Elk River	On line between secs.25 and 36, T.130 N., R.30 W., Morrison County, at culvert on county road, 4.4 miles northwest of Little Falls, Minn.	-	1969	8-18-70	0
Elk River	Mississippi River	SE¼NW¼ sec.36, T.130 N., R.30 W., Morrison County, at county road, 3.8 miles northwest of Little Falls, Minn.	-	-	8-18-70	.26
Elk River	Mississippi River	Lat 46°01'13", long 94°22'38", in NW¼NE¼ sec.6, T.129 N., R.29 W., Morrison County, at bridge on County Highway 13, 1 mile upstream from mouth, and 3 miles north of Little Falls, Minn.	b135	1968-69	*8-18-70	.14
Swan River	Mississippi River	NE¼SW¼ sec.35, T.129 N., R.32 W., Todd County, at county road, 0.4 mile northeast of Pillsbury, Minn.	-	-	8-17-70	0
Pillsbury Creek	Swan River	NW¼NW¼ sec.2, T.128 N., R.32 W., Todd County, on county road at outlet of Little Swan Lake, at Pillsbury, Minn.	-	1944-45	8-17-70	5.73

* 1970 water-year measurements other than those shown are listed under measurements made at low-flow partial-record stations.
a Published as Mississippi River tributary in 1969.
b Approximately.

Discharge measurements made in the Mississippi-Sauk watershed, Minn., Aug. 17-20, 1970--Continued

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
Swan River	Mississippi River	Lat 45°56'03", long 94°34'50", in SW¼SE¼ sec.33, T.129 N., R.31 W., Morrison County, at bridge on county road, 2.8 miles southwest of Flensburg, Minn.	-	1969	8-17-70	6.57
Swan River	Mississippi River	Lat 45°56'00", long 94°24'34", in NW¼NW¼ sec.1, T.128 N., R.30 W., Morrison County, at bridge on State Highway 238, 1.5 miles upstream from mouth, and 3 miles southwest of Little Falls, Minn.	-	1968-69	*8-17-70	12.9
North Branch Two Rivers	Mississippi River	On line between secs.3 and 4, T.127 N., R.30 W., Morrison County, on county highway, 2 miles east of Elmdale, Minn.	-	-	8-18-70	.20
North Branch Two Rivers	Mississippi River	NE¼NW¼ sec.8, T.127 N., R.29 W., Morrison County, at bridge on County Highway 224, 0.3 mile upstream from mouth, and 2.2 miles northeast of Bowlus, Minn.	-	1969	8-18-70	1.88
Two Rivers	Mississippi River	On line between secs.14 and 15, T.127 N., R.30 W., Morrison County, at county road, 1 mile upstream from South Branch, and 1.5 miles southwest of Bowlus, Minn.	-	1969	8-18-70	3.02
South Branch Two Rivers	Two Rivers	On line between secs.14 and 23, T.127 N., R.30 W., Morrison County, on County Highway 21, 0.1 mile upstream from mouth, and 1.3 miles southwest of Bowlus, Minn.	-	-	8-18-70	4.70
Two Rivers	Mississippi River	SW¼SW¼ sec.8, T.127 N., R.29 W., Morrison County, at bridge on County Highway 25, 0.3 mile upstream from mouth, and 2 miles east of Bowlus, Minn.	b153	1969	8-18-70	6.43
Spunk Creek	Mississippi River	On line between sec.2, T.125 N., R.30 W., and sec.35, T.126 N., R.30 W., Stearns County, on County Highway 52, 4.6 miles southeast of Holdingford, Minn.	-	-	8-18-70	2.49
Spunk Creek	Mississippi River	Lat 45°47'04", long 94°18'54", in SE¼NW¼ sec.27, T.127 N., R.29 W., Morrison County, at bridge on County Highway 21, 1.5 miles upstream from mouth, and 3.4 miles southwest of Royalton, Minn.	-	1968-69	*8-18-70	4.22
Platte River	Mississippi River	On line between secs.26 and 27, T.42 N., R.30 W., Morrison County, at triple box culvert on State Highway 25, 3.5 miles southeast of Harding, Minn.	-	1969	8-20-70	1.13
Big Mink Creek	Platte River	On line between secs.29 and 30, T.41 N., R.30 W., Morrison County, at bridge on county road, 3.6 miles northwest of Pierz, Minn.	-	1969	8-20-70	.64
Pierz Lake Outlet	Platte River	NW¼SE¼ sec.14, T.40 N., R.31 W., Morrison County, at twin culverts on County Highway 36, at Pierz Lake Outlet, 3 miles southwest of Pierz, Minn.	-	1969	8-19-70	.42
Skunk River	Platte River	On line between secs.20 and 21, T.41 N., R.29 W., Morrison County, at double box culvert on County Highway 267, 2.6 miles southeast of Lastrup, Minn.	-	1969	8-18-70	3.13
Skunk River	Platte River	On line between sec.9, T.40 N., R.30 W., and sec.36, T.41 N., R.30 W., Morrison County, at double box culvert on County Highway 39, 1.1 miles east of Pierz, Minn.	-	1969	8-18-70	7.45

* 1970 water-year measurements other than those shown are listed under measurements made at low-flow partial-record stations.

b Approximately.

Discharge measurements made in the Mississippi-Sauk watershed, Minn., Aug. 17-20, 1970--Continued

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
✗Hillman Creek	Skunk River	NE¼SE¼ sec.9, T.40 N., R.30 W., Morrison County, at bridge on county road, 1.1 miles upstream from mouth, and 1.5 miles east of Pierz, Minn.	52.6	1964-69	8-18-70	1.74
Skunk Creek c/	Skunk River	On line between secs.20 and 21, T.40 N., R.30 W., Morrison County, at County Highway 239, 1.5 miles southeast of Genola, Minn.	-	1969	8-18-70	.07
Skunk River	Platte River	On line between secs.29 and 30, T.40 N., R.30 W., Morrison County, at culvert on State Highway 25, 1.6 miles south of Genola, Minn.	-	1969	8-19-70	10.2
Skunk River	Platte River	On line between secs.26 and 27, T.40 N., R.31 W., Morrison County, at bridge on county road, 4.6 miles northwest of Buckman, Minn.	-	1969	8-18-70	11.6
Rice Creek	Platte River	On line between secs.17 and 20, T.40 N., R.31 W., Morrison County, at triple culvert on county road, 0.7 mile upstream from Rice Lake, and 6.1 miles east of Little Falls, Minn.	-	1969	8-19-70	4.03
Platte River tributary	Platte River	On N½ line between sec.19, T.40 N., R.31 W., and sec.24, T.40 N., R.32 W., Morrison County, at County Highway 256, 5 miles southeast of Little Falls, Minn.	-	1969	8-19-70	0
Platte River	Mississippi River	NW¼NW¼ sec.31, T.40 N., R.31 W., Morrison County, at bridge on County Highway 35, downstream from Rice Lake, and 6 miles southeast of Little Falls, Minn.	-	1938, 1963-65, 1969	8-18-70	46.8
Platte River	Mississippi River	NE¼NW¼ sec.12, T.39 N., R.32 W., Morrison County, at bridge on County Highway 34, 4.7 miles north of Royalton, Minn.	-	1969	8-19-70	41.2
Little Rock Creek	Mississippi River	SE¼NE¼ sec.33, T.39 N., R.31 W., Morrison County, at triple box culvert on County Highway 26, 4.5 miles east of Royalton, Minn.	-	1969	8-18-70	2.21
Bunker Hill Creek	Little Rock Creek	NW¼SE¼ sec.10, T.38 N., R.31 W., Benton County, on County Highway 40, 0.3 mile upstream from mouth, and 3.8 miles northeast of Rice, Minn.	-	-	8-19-70	.03
Little Rock Creek	Mississippi River	NW¼NE¼ sec.28, T.38 N., R.31 W., Benton County, on County Highway 12 at northeast corner of Rice, Minn., and 2 miles upstream from Little Rock Lake.	-	1969	8-19-70	10.6
Sucker Creek	Little Rock Lake	NE¼SW¼ sec.11, T.37 N., R.31 W., Benton County, on county road, 0.4 mile upstream from Little Rock Lake, and 3.9 miles southeast of Rice, Minn.	-	-	8-19-70	.04
South Fork Watab River	Watab River	SW¼NE¼ sec.9, T.124 N., R.29 W., Stearns County, on U.S. Highway 52, at northwest edge of St. Joseph, Minn., 1 mile upstream from North Fork.	-	-	8-19-70	.69
North Fork Watab River	Watab River	SE¼NW¼ sec.4, T.124 N., R.29 W., Stearns County, on County Highway 3, 1.4 miles northwest of St. Joseph, Minn., and 0.4 mile upstream from mouth.	-	-	8-19-70	1.78

✗ Crest-stage partial-record station.
c Published as Skunk River tributary in 1969.

Discharge measurements made in the Mississippi-Sauk watershed, Minn., Aug. 17-20, 1970--Continued

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water yeers)	Measurements	
					Date	Discharge (cfs)
Watab River	Mississippi River	Lat 45°37'09", long 94°13'38", in NE¼SE¼ sec.20, T.125 N., R.28 W., Stearns County, at bridge on county road, 1.1 miles west of Sartell, Minn.	-	1969	8-19-70	5.31
Sauk River	Mississippi River	NE¼NW¼ sec.21, T.128 N., R.35 W., Todd County, at State Highway 27, 0.5 mile downstream from Lake Osakis, and 3.5 miles northeast of Osakis, Minn.	-	1950	8-17-70	2.80
Sauk River	Mississippi River	On line between sec.2, T.127 N., R.34 W., and sec.35, T.128 N., R.34 W., Todd County, at bridge on county road, 1.1 miles south of Little Sauk, Minn.	-	1969	8-17-70	14.2
Ashley Creek	Sauk River	On line between secs.13 and 14, T.126 N., R.36 W., Pope County, at County Highway 33, 0.4 mile northeast of Westport, Minn.	-	-	*8-18-70	2.46
Silver Creek	Ashley Creek	SE¼NW¼ sec.25, T.127 N., R.35 W., Todd County, at county highway 0.3 mile upstream from mouth, 2.7 miles southeast of West Union, and 4.5 miles northwest of Sauk Centre, Minn.	-	-	8-18-70	1.06
Ashley Creek	Sauk River	Lat 45°46'46", long 94°58'52", in NW¼SE¼ sec.29, T.127 N., R.34 W., Todd County, at bridge on County Highway 11, 3 miles north of Sauk Centre, Minn.	-	1968-69	*8-18-70	4.96
Hoboken Creek	Sauk River	NW¼NW¼ sec.9, T.126 N., R.34 W., Stearns County, at County Highway 17 in Sauk Centre, Minn., 0.4 mile upstream from Sauk Lake.	-	-	8-18-70	0
Sauk River	Mississippi River	NW¼SE¼ sec.15, T.126 N., R.34 W., Stearns County, at county road in Sauk Centre, Minn., 1.5 miles below dam at outlet of Sauk Lake.	-	1941, 1969	8-18-70	20.6
Sauk River tributary	Sauk River	NE¼NE¼ sec.2, T.125 N., R.34 W., Stearns County, at culvert on County Highway 29, 3.6 miles northwest of Meire Grove, Minn.	-	1969	8-18-70	0
Sauk River tributary	Sauk River	SE¼SE¼ sec.29, T.126 N., R.33 W., Stearns County, at County Highway 65, 0.2 mile upstream from mouth, and 2.3 miles northwest of Melrose, Minn.	-	-	8-18-70	0
Prairie Creek	Adley Creek	SW¼NE¼ sec.23, T.127 N., R.33 W., Todd County, at State Highway 28, 0.2 mile upstream from Little Birch Lake, and 0.7 mile northeast of Ward Springs, Minn.	-	-	8-18-70	0
Adley Creek	Sauk River	Lat 45°41'00", long 94°46'13", in NE¼NE¼ sec.36, T.126 N., R.33 W., Stearns County, at culvert on County Highway 168, 2.2 miles east of Melrose, Minn.	-	1969	8-18-70	5.28
Sauk River tributary	Sauk River	NW¼NE¼ sec.1, T.125 N., R.33 W., Stearns County, at county road 0.7 mile upstream from mouth, and 1.8 miles southeast of Melrose, Minn.	-	-	8-18-70	0
Sauk River	Mississippi River	Lat 45°37'32", long 94°45'39", in NE¼NW¼ sec.19, T.125 N., R.32 W., Stearns County, at bridge on County Highway 30, 1 mile southwest of New Munich, Minn.	-	1968-69	*8-18-70	36.4

* 1970 water year measurements other than those shown are listed under measurements made at low-flow partial-record stations.

Discharge measurements made in the Mississippi-Sauk watershed, Minn., Aug. 17-20, 1970--Continued

Stream	Tributary to	Location	Drainage area (sq mi)	Measurad previously (water years)	Measurements	
					Date	Discharge (cfs)
County ditch No. 44	Sauk River	On line between sec.31, T.125 N., R.32 W., and sec.36, T.125 N., R.33 W., Stearns County, at bridge on county road, 0.4 mile upstream from mouth, and 2.3 miles southwest of New Munich, Minn.	-	1969	8-18-70	.10
Getchell Creek	Sauk River	Lat 45°34'36", long 94°45'55", in NE¼SE¼ sec.1, T.124 N., R.33 W., Stearns County, at bridge on County Highway 12, 0.3 mile upstream from mouth, and 4 miles south of New Munich, Minn.	-	1969	8-18-70	.79
Stony Creek	Sauk River	SE¼NE¼ sec.23, T.124 N., R.33 W., Stearns County, at culvert on county road, 0.2 mile upstream from mouth, and 2.2 miles northeast of Spring Hill, Minn.	-	1969	8-18-70	1.88
Sauk River tributary	Sauk River	SE¼NW¼ sec.25, T.124 N., R.33 W., Stearns County, at county road, 0.3 mile upstream from mouth, and 2.7 miles east of Spring Hill, Minn.	-	-	8-18-70	.32
Sauk River	Mississippi River	Lat 45°29'56", long 94°37'44", on line between sec.6, T.123 N., R.31 W., and sec.31, T.124 N., R.31 W., Stearns County, at bridge on county road, 1.9 miles southwest of Farming, Minn.	-	1969	8-18-70	46.0
Sauk River tributary	Sauk River	SW¼NE¼ sec.3, T.122 N., R.29 W., Stearns County, at outlet of Pearl Lake, 1.1 miles northeast of Marty, Minn.	-	-	8-19-70	3.30
Sauk River tributary	Sauk River	SW¼SW¼ sec.9, T.123 N., R.29 W., Stearns County, at bridge on State Highway 23, 0.1 mile upstream from mouth, in Rockville, Minn.	-	1969	8-19-70	4.85
✓Johnson Creek	Mississippi River	NW¼SW¼ sec.13, T.123 N., R.28 W., Stearns County, at bridge on County Highway 7, 1.1 miles south of St. Augusta, Minn.	-	1964-69	8-19-70	6.46
Plum Creek	Mississippi River	NE¼NE¼ sec.33, T.123 N., R.27 W., Stearns County, at culvert on State Highway 152, 1.7 miles northwest of Clearwater, Minn.	-	1969	8-19-70	1.32
Clearwater River	Mississippi River	Lat 45°17'54", long 94°15'38", in SW¼SW¼ sec.7, T.121 N., R.28 W., Stearns County, at bridge on State Highway 55, 0.1 mile upstream from Lake Marie, and 2.1 miles southeast of Kimball Prairie, Minn.	-	1969	8-19-70	.40
Clearwater River tributary	Clearwater River	NW¼NE¼ sec.21, T.121 N., R.27 W., Wright County, at State Highway 24, 0.1 mile upstream from Clearwater Lake, and 2.3 miles northeast of Annandale, Minn.	-	-	8-19-70	.32
Clearwater River	Mississippi River	Lat 45°24'40", long 94°03'44", in NW¼NE¼ sec.3, T.122 N., R.27 W., Stearns County, at bridge on county road, at southwest corner of Clearwater, Minn.	-	1969	8-19-70	5.68
Silver Creek	Mississippi River	Lat 45°22'37", long 93°56'31", in SW¼NE¼ sec.15, T.122 N., R.26 W., Wright County, at county road, 1.6 miles northeast of Hasty, Minn.	-	1969	*8-19-70	1.55
Otter Creek	Mississippi River	NE¼SW¼ sec.3, T.121 N., R.25 W., Wright County, at State Highway 152, 0.4 mile upstream from mouth, and 1.4 miles northwest of Monticello, Minn.	-	-	8-19-70	.62

* 1970 water year measurements other than those shown are listed under measurements made at low-flow partial-record stations.

✓ Crest-stage partial-record station.

Discharge measurements made in the Mississippi-Sauk watershed, Minn., Aug. 17-20, 1970--Continued

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
Mayhew Creek	Elk River	NE¼NW¼ sec.26, T.36 N., R.30 W., Benton County, 300 ft upstream from mouth, 500 ft northwest of Elk River bridge on State Highway 95, and 6 miles east of St. Cloud, Minn.	-	1968-69	*8-19-70	.18
Elk River	Mississippi River	Lat 45°35'14", long 94°02'25", in NE¼NW¼ sec.26, T.36 N., R.30 W., Benton County, at bridge on State Highway 95, 6 miles east of St. Cloud, Minn.	-	1968-69	*8-19-70	3.70
Elk River	Mississippi River	On line between sec.31, T.35 N., R.29 W., and sec.36, T.35 N., R.30 W., Sherburne County, on County Highway 20, 2.8 miles northwest of Clear Lake, Minn.	-	-	8-19-70	13.7
Rice Creek	Elk River	At center of N½ sec.29, T.35 N., R.29 W., Sherburne County, at bridge on County Highway 61, 3.8 miles northeast of Clear Lake, Minn.	-	1969	*8-19-70	3.49
Briggs Creek	Elk River	On line between secs.15 and 22, T.35 N., R.29 W., Sherburne County, at County Highway 48, 0.7 mile northeast of Lake Briggs, and 5.9 miles northeast of Clear Lake, Minn.	-	-	8-19-70	3.32
Elk River	Mississippi River	On line between secs.13 and 14, T.34 N., R.29 W., Sherburne County, at bridge on State Highway 25, 2.2 miles northwest of Becker, Minn.	-	1969	8-19-70	22.3
Elk River	Mississippi River	On line between secs.1 and 2, T.33 N., R.28 W., Sherburne County, at bridge on County Highway 73, 0.9 mile upstream from Snake River, and 3.6 miles northwest of Big Lake, Minn.	-	-	8-19-70	29.9
Snake River	Elk River	SW¼SW¼ sec.36, T.34 N., R.28 W., Sherburne County, at culvert on County Highway 73, 4.1 miles northwest of Big Lake, Minn.	-	1969	*8-19-70	8.46
St. Francis River	Elk River	SW¼NW¼ sec.27, T.35 N., R.27 W., Sherburne County, at County Highway 9, about 1 mile upstream from Rice Lake, and 4.2 miles northeast of Orrock, Minn.	-	1969	*8-20-70	6.09
St. Francis River tributary	St. Francis River	On line between secs.2 and 3, T.34 N., R.27 W., Sherburne County, at culvert on County Highway 43, 0.4 mile upstream from mouth, and 3.5 miles northeast of Orrock, Minn.	-	1969	*8-20-70	.57
Battle Brook	St. Francis River	On line between secs.19 and 30, T.35 N., R.26 W., Sherburne County, at culvert on County Highway 9, 0.5 mile upstream from Elk Lake, and 4.4 miles northwest of Lake Fremont, Minn.	-	1969	*8-20-70	1.72

* 1970 water year measurements other than those shown are listed under measurements made at low-flow partial-record stations.

Low-flow investigations in the Rum River basin

During the period Aug. 17-21, 1970, a series of streamflow measurements was made in the Rum River basin to study base-flow yield from various parts of the basin. In the 9 days preceding the measurement period, a light rain occurred on Aug. 11-12 and a more general rain fell during the night of Aug. 14. Total rainfall amounts from these two storms ranged from 0.3 inch near Mille Lacs Lake in the north to 1.5 inches in the southern part of the basin. There was a small increase in streamflow from the rain but by Aug. 17, conditions were near normal so flows measured should represent essentially base flow.

Discharge measurements made in the Rum River basin, Minn., Aug. 17-21, 1970

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
Mille Lacs Lake tributary	Mille Lacs Lake	NE¼SE¼ sec.12, T.44 N., R.28 W., Crow Wing County, at U.S. Highway 169, 300 feet upstream from mouth, and 0.9 mile northeast of Garrison, Minn.	-	-	8-17-70	0
Rum River	Mississippi River	Lat 46°09'36", long 93°46'00", in SW¼ sec.33, T.43 N., R.27 W., Mille Lacs County, at bridge on U.S. Highway 169, at Mille Lacs Lake outlet, at Vineland, Minn.	a378	1909-10, 1946-47, 1952-53, 1965-69	8-17-70	96.0
Rum River	Mississippi River	On line between secs.5 and 6, T.41 N., R.26 W., Mille Lacs County, at bridge on U.S. Highway 169, 0.8 mile south of Onamia, Minn.	414	1911-13≠, 1953, 1965, 1968-69	*8-17-70	107
Bradbury Brook	Rum River	On line between secs.29 and 30, T.41 N., R.26 W., Mille Lacs County, at bridge on U.S. Highway 169, 0.15 mile upstream from mouth, and 5 miles south of Onamia, Minn.	-	1969	8-17-70	.32
Tibbetts Brook	Rum River	On line between secs.27 and 28, T.39 N., R.27 W., Mille Lacs County, at County Highway 19, about 1 mile upstream from mouth, and 6.9 miles northwest of Milaca, Minn.	-	-	8-17-70	.19
Rum River	Mississippi River	On line between secs.13 and 24, T.38 N., R.27 W., Mille Lacs County, at bridge on County Highway 9, 1.8 miles north of Milaca, Minn.	-	1968-69	*8-18-70	97.2
Vardell Brook	Rum River	On line between secs.4 and 9, T.37 N., R.26 W., Mille Lacs County, at county road, 0.7 mile upstream from mouth, and 3.8 miles southeast of Milaca, Minn.	-	-	8-18-70	.04
Bogus Brook	Rum River	On line between secs.23 and 26, T.37 N., R.26 W., Mille Lacs County, at County Highway 1, 0.2 mile upstream from mouth, and 1.6 miles east of Woodward Brook, Minn.	-	1969	8-18-70	0
Rum River	Mississippi River	SW¼SE¼ sec.28, T.36 N., R.26 W., Mille Lacs County, at State Highway 95, 1000 feet upstream from West Branch Rum River, and in Princeton, Minn.	-	1961, 1965	8-18-70	111
West Branc Rum River	Rum River	On line between sec.19, T.38 N., R.27 W. and sec.24, T.38 N., R.28 W., Mille Lacs-Benton County line, at county road, 3.5 miles northwest of Foreston, Minn.	-	-	8-18-70	.06
West Branch Rum River	Rum River	On line between secs.26 and 35, T.37 N., R.27 W., Mille Lacs County, at County Highway 12, 0.8 mile upstream from Estes Brook, and 6.2 miles south of Milaca, Minn.	-	-	8-18-70	3.64
West Branch Rum River	Rum River	Lat 45°34'24", long 93°34'47", in NE¼ sec.33, T.36 N., R.26 W., Mille Lacs County, at bridge on U.S. Highway 169, 400 ft upstream from mouth, in Princeton, Minn.	-	1961, 1965, 1968-69	*8-18-70	7.39

* 1970 water year measurements other than those shown are listed under measurements made at low-flow partial-record stations.
≠ Operated as a continuous-record gaging station.
a Approximately.

Discharge measurements made in the Rum River basin, Minn., Aug. 17-21, 1970--Continued

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
Spencer Brook	Rum River	NE¼SE¼ sec.17, T.35 N., R.25 W., Isanti County, at County Highway 5, 1.5 miles upstream from mouth, 1.5 miles west of Spencer Brook, and 6 miles southeast of Princeton, Minn.	-	1965, 1969	8-18-70	3.03
Rum River	Mississippi River	Lat 45°31'45", long 93°26'21", in NW¼NE¼ sec.15, T.35 N., R.25 W., Isanti County, at bridge on County Highway 7, 200 ft downstream from Spencer Brook, 0.5 mile north of village of Spencer Brook, and 7.5 miles southeast of Princeton, Minn.	-	1957-59, 1960-64≠, 1965	8-18-70	141
Green Lake Brook	Rum River	On line between sec.31, T.36 N., R.24 W., and sec.36, T.36 N., R.25 W., Isanti County, 0.2 mile upstream from mouth, and 0.5 mile north of West Point, Minn.	-	1965, 1969	8-19-70	4.79
Rum River tributary	Rum River	NE¼NW¼ sec.34, T.36 N., R.24 W., Isanti County, at County Highway 65, 0.5 mile upstream from mouth, 0.8 mile south of Walbo, and 4.7 miles west of Cambridge, Minn.	-	-	8-19-70	.77
Stanchfield Creek	Rum River	On line between secs.21 and 28, T.37 N., R.24 W., Isanti County, at County Highway 3, 0.5 mile upstream from Ties Creek, 3 miles northeast of Dalbo, and 9 miles northwest of Cambridge, Minn.	-	-	8-19-70	2.39
Ties Creek	Stanchfield Creek	On line between secs.11 and 14, T.37 N., R.24 W., Isanti County, at county road 2.5 miles upstream from mouth, and 6.6 miles southwest of Braham, Minn.	-	-	8-19-70	.38
Stanchfield Creek	Rum River	Lat 45°36'59", long 93°18'06", on line between secs.11 and 14, T.36 N., R.24 W., Isanti County, at bridge on County Highway 32, 1 mile south of Springvale, Minn., 1.5 miles upstream from mouth, and 3 miles northeast of Walbo, Minn.	-	1965, 1968-69	*8-19-70	5.86
Lower Stanchfield Creek	Rum River	On line between secs.5 and 8, T.36 N., R.23 W., Isanti County, at County Highway 6 at Little Stanchfield Lake outlet, and 1.9 miles southwest of Grandy, Minn.	-	1969	*8-19-70	4.18
Rum River	Mississippi River	NE¼NW¼ sec.32, T.36 N., R.23 W., Isanti County, at State Highway 95, at west edge of Cambridge, Minn.	1,160	1909-14≠, 1965, 1969	8-19-70	163
Isanti Brook	Rum River	At center of S½ sec.17, T.35 N., R.23 W., Isanti County, at State Highway 65, 2 miles upstream from mouth, and 2.1 miles northeast of Isanti, Minn.	-	1969	8-20-70	.15
Rum River tributary	Rum River	On line between secs.23 and 24, T.35 N., R.24 W., Isanti County, at County Highway 10, 1 mile upstream from mouth, and 2.1 miles northwest of Isanti, Minn.	-	-	8-20-70	1.33
Long Lake outlet	Rum River	On line between secs.9 and 10, T.34 N., R.24 W., Isanti County, at County Highway 10, 1.5 miles downstream from Long Lake, and 4.7 miles southwest of Isanti, Minn.	-	1965, 1969	8-20-70	1.01
Seeley Creek	Rum River	Lat 45°21'58", long 93°22'20", in SW¼NE¼ sec.7, T.33 N., R.24 W., Anoka County, at bridge on County Highway 55, 1.6 miles south of St. Francis, Minn.	-	1965, 1969	*8-20-70	2.02

* 1970 water year measurements other than those shown are listed under measurements made at low-flow partial-record stations.
≠ Operated as a continuous-record gaging station.

Discharge measurements made in the Rum River basin, Minn., Aug. 17-21, 1970--Continued

Stream	Tributary to	Location	Drainage area (sq mi)	Measured previously (water years)	Measurements	
					Date	Discharge (cfs)
Cedar Creek	Rum River	SE¼NW¼ sec.5, T.33 N., R.23 W., Anoka County, at State Highway 65, 1.5 miles south of Coopers Corner (intersection of State Highway 65 and County Highway 24), and 2.4 miles southeast of Bethel, Minn.	-	-	8-20-70	7.89
Crooked Brook	Cedar Creek	SW¼NE¼ sec.30, T.33 N., R.23 W., Anoka County, at County Highway 22, 1.5 miles upstream from mouth, and 2.4 miles northwest of Soderville, Minn.	-	-	8-20-70	1.83
Cedar Creek	Rum River	NW¼SW¼ sec.24, T.33 N., R.24 W., Anoka County, at County Highway 13, 1.2 miles north of Cedar, and 4.9 miles south of Bethel, Minn.	-	-	8-20-70	15.6
Cedar Creek	Rum River	Lat 45°15'57", long 93°21'59", in SW¼SW¼ sec.32, T.33 N., R.24 W., Anoka County, at bridge on county road, 0.5 mile upstream from mouth, 4.3 miles southwest of Cedar, and 7 miles north of Anoka, Minn.	-	1965, 1968-69	*8-20-70	20.9
Ford Brook	Trott Brook	NE¼SW¼ sec.2, T.32 N., R.25 W., Anoka County, at County Highway 63, 0.3 mile upstream from mouth, 3.6 miles southeast of Nowthen, Minn., and 6.6 miles northwest of Anoka, Minn.	-	-	8-21-70	1.48
Trott Brook	Rum River	Lat 45°17'16", long 93°25'08", in NW¼SE¼ sec.2, T.32 N., R.25 W., Anoka County, at State Highway 47, 0.8 mile upstream from mouth, and 3.9 miles southeast of Nowthen, Minn.	-	*1965, 1969	8-21-70	7.64
Rum River	Mississippi River	NW¼SW¼ sec.6, T.31 N., R.24 W., Anoka County, at bridge on U.S. Highway 10, 1 mile upstream from mouth, in Anoka, Minn., and 0.5 mile north of U.S. Post Office.	-	1952, 1965	8-21-70	202

* 1970 water year measurements other than those shown are listed under measurements made at low-flow partial-record stations.

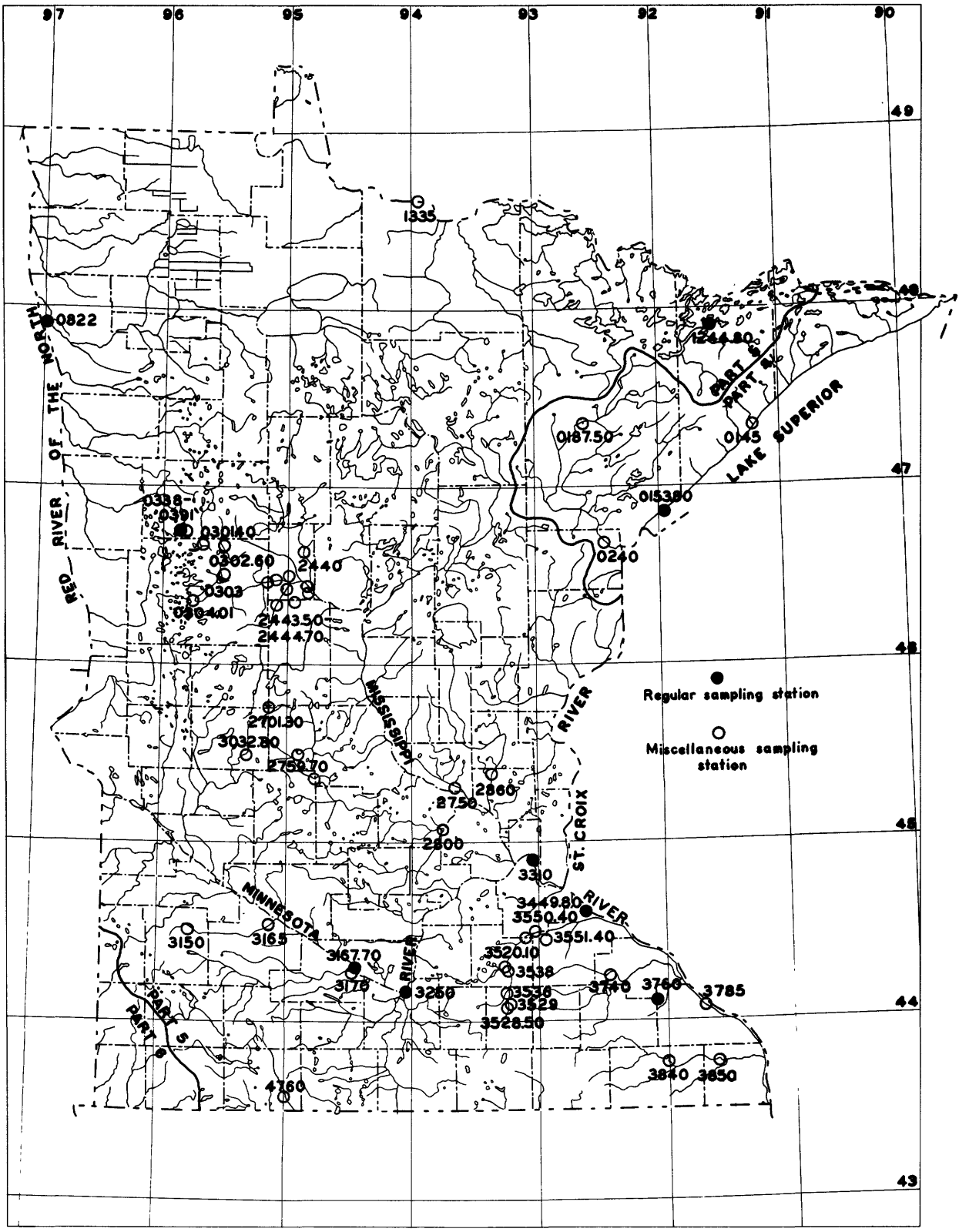


Figure 3.-- Map showing location of water-quality stations.

PART 2. WATER QUALITY RECORDS

04015380 LAKE SUPERIOR AT DULUTH, MINN.

LOCATION.--Lat 46°51'33", long 91°57'20", in NE¼ sec.35, T.51 N., R.13 W., St. Louis County, at intake of City of Duluth Lakewood Pumping Plant, 3.8 miles northeast of the Lester River and 10 miles northeast of Duluth post office.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	ALKALINITY AS CACO3 (MG/L)	SULFATE (SO4) (MG/L)	CHLORIDE (CL) (MG/L)	HARDNESS (CA,MG) (MG/L)	PH (UNITS)	TEMPERATURE (DEG C)	COLOR (PLATINUM-COBALT UNITS)	TURBIDITY (JTU)
OCT.								
06...	43	2.8	1.5	44	7.8	11.1	0	1.0
08-10	--	--	--	--	--	--	--	--
10...	43	2.2	1.5	44	7.8	10.0	5	1.5
10...	43	3.0	2.0	44	7.9	7.2	0	2.0
27...	43	3.0	1.5	44	7.9	6.0	0	1.0
NOV.								
03...	43	2.9	1.5	44	8.0	7.8	0	.0
03-05	--	--	--	--	--	--	--	--
04...	--	--	--	--	--	13.0	--	--
11...	43	3.1	1.5	44	7.9	7.8	0	1.0
17...	43	3.1	1.5	44	7.9	6.1	0	1.0
24...	43	1.5	1.5	44	7.9	5.6	--	1.0
DEC.								
01...	43	3.0	1.3	44	7.9	5.6	0	.9
01-03	--	--	--	--	--	--	--	--
08...	43	2.2	1.5	44	7.9	4.4	0	3.5
15...	43	2.8	1.3	44	7.8	4.0	0	.0
15...	--	--	--	--	--	4.0	--	--
22...	43	2.7	1.3	44	7.9	4.0	0	.0
29...	43	2.9	1.3	44	7.8	3.0	0	.0
JAN.								
05...	43	3.4	1.3	44	7.9	4.0	0	.0
05-07	--	--	--	--	--	--	--	--
12...	43	3.0	1.3	44	7.9	3.0	0	.0
19...	43	3.2	1.3	44	7.9	3.3	0	.0
19...	--	--	--	--	--	3.0	--	--
26...	43	4.3	1.2	44	7.9	3.3	0	.0
FEB.								
02...	43	2.9	1.3	44	7.8	3.0	0	.0
02-03	--	--	--	--	--	--	--	--
09...	43	3.4	1.3	44	7.8	1.0	0	.0
16...	43	2.9	1.3	44	7.8	2.0	0	.0
24...	43	2.8	1.3	44	7.8	3.0	0	.0
MAR.								
01-04	--	--	--	--	--	--	--	--
02...	43	2.9	1.3	44	7.8	1.1	0	.0
10...	43	3.1	1.3	44	7.9	1.1	0	.0
16...	43	3.3	1.3	44	7.9	.6	0	.0
30...	--	--	--	--	--	.0	--	--
30...	43	3.0	1.3	44	7.8	.6	0	.0

DATE	NITRATE (NO3) (MG/L)	NITRATE (N) (MG/L)	DISSOLVED PHOSPHORUS (P) (MG/L)	TOTAL PHOSPHORUS (P) (MG/L)	METHYLENE BLUE ACTIVE SUBSTANCE (MG/L)	AMMONIA NITROGEN (N) (MG/L)	ORGANIC NITROGEN (N) (MG/L)	SODIUM (NA) (MG/L)	POTASSIUM (K) (MG/L)	DISSOLVED FLUORIDE (F) (MG/L)	PERCENT SODIUM	SODIUM ADSORPTION RATIO
NOV.												
04...	1.5	.30	.05	.05	.00	.03	.21	--	--	--	--	--
DEC.												
15...	1.5	.30	.06	.06	.00	.02	.42	--	--	--	--	--
JAN.												
05...	.6	.14	.01	.16	.00	.00	.21	--	--	--	--	--
19...	1.5	.30	.00	.02	.00	.06	.41	--	--	--	--	--
FEB.												
24...	1.4	.30	.00	.01	.00	.04	.10	--	--	--	--	--
MAR.												
30...	.6	.14	.01	.16	.00	.00	.21	--	--	--	--	--
JUNE												
08...	1.3	.30	.02	.06	.00	.00	.03	--	--	--	--	--
JULY												
13...	1.5	.35	.02	.03	.00	.01	.10	--	--	--	--	--
AUG.												
25...	1.6	.35	.00	.00	.02	.00	.10	1.3	.6	.0	6	.1
SEPT.												
21...	1.5	.34	.00	.00	.00	.01	.09	--	--	--	--	--

04015380 LAKE SUPERIOR AT DULUTH, MINN.--Continued

PERIOD OF RECORD.--Chemical analyses: August 1969 to current year.
REMARKS.--Some analyses furnished by City of Duluth, Water, Gas, and Sewage Treatment Department and Water Quality Office, Environmental Protection Agency.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	DIS-SOLVED OXYGEN (MG/L)	BIO-CHEM-ICAL OXYGEN DEMAND (MG/L)	COLI-FORM (MPN)	SPECI-FIC CONDUCTANCE (MICRO-MHOS)	SAMPLE SIZE (GALS)	TOTAL CARBON EX-TRACTABLES (UG/L)	CARBON CHLORO-FORM EX-TRACTABLES (UG/L)	CARBON ALCOHOL EX-TRACTABLES (UG/L)
OCT.								
06...	10.7	.7	6	--	--	--	--	--
08-10	--	--	--	--	1005	221	44	177
10...	11.1	.4	10	--	--	--	--	--
10...	11.4	.4	0	--	--	--	--	--
27...	12.3	.4	6	--	--	--	--	--
NOV.								
03...	11.7	.3	4	--	--	--	--	--
03-05	--	--	--	--	1162	231	57	174
04...	--	--	--	--	--	--	--	--
11...	11.8	.4	1	--	--	--	--	--
17...	12.2	.3	24	--	--	--	--	--
24...	12.6	.3	4	--	--	--	--	--
DEC.								
01...	13.1	.2	5	--	--	--	--	--
01-03	--	--	--	--	1027	122	21	101
08...	12.9	.4	1	--	--	--	--	--
15...	13.1	.3	3	--	--	--	--	--
15...	--	--	--	--	--	--	--	--
22...	13.1	.2	2	--	--	--	--	--
29...	13.6	.2	4	--	--	--	--	--
JAN.								
05...	13.3	.3	3	--	--	--	--	--
05-07	--	--	--	--	1402	162	15	147
12...	13.8	.5	2	100	--	--	--	--
19...	14.0	.3	0	--	--	--	--	--
19...	--	--	--	--	--	--	--	--
26...	13.9	.3	4	--	--	--	--	--
FEB.								
02...	13.0	.3	2	--	--	--	--	--
02-03	--	--	--	--	1065	223	42	181
09...	14.2	.3	0	--	--	--	--	--
16...	13.5	.4	1	--	--	--	--	--
24...	12.7	.3	3	100	--	--	--	--
MAR.								
01-04	--	--	--	--	983	246	46	200
02...	13.4	.4	1	--	--	--	--	--
10...	14.3	.4	2	100	--	--	--	--
16...	14.2	.5	0	100	--	--	--	--
30...	--	--	--	--	--	--	--	--
30...	13.9	.4	3	100	--	--	--	--

04015380 LAKE SUPERIOR AT DULUTH, MINN.--Continued

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	ALKALINITY AS CACO3 (MG/L)	SULFATE (SO4) (MG/L)	CHLORIDE (CL) (MG/L)	HARDNESS (CA,MG) (MG/L)	PH (UNITS)	TEMPERATURE (DEG C)	COLOR (PLATINUM-COBALT UNITS)	TURBIDITY (JTU)
APR.								
13...	43	3.8	1.3	44	7.8	1.7	0	9.0
20...	43	4.0	1.3	44	8.0	1.7	0	2.0
27...	43	2.9	1.3	44	7.9	1.3	0	1.0
MAY								
04...	43	3.8	1.3	44	7.9	2.2	5	2.0
04-05	--	--	--	--	--	--	--	--
11...	43	3.1	1.3	44	7.9	2.2	0	2.0
18...	43	3.2	1.3	44	7.9	3.3	0	1.0
25...	43	3.8	1.3	45	7.9	3.3	0	.0
JUNE								
01...	43	2.9	1.3	44	8.0	3.9	5	.0
01-03	--	--	--	--	--	--	--	--
08...	43	3.3	1.3	44	7.9	4.0	0	5.0
08...	--	--	--	--	--	39.0	--	--
15...	43	2.9	1.3	44	8.0	4.4	0	2.0
22...	43	3.1	1.3	44	8.0	4.0	0	1.0
29...	43	4.6	1.3	45	7.9	7.0	0	1.0
JULY								
06...	43	3.2	1.5	44	7.9	5.0	0	3.0
06-08	--	--	--	--	--	--	--	--
13...	--	--	--	--	--	10.0	--	--
20...	43	3.1	1.5	44	7.9	11.0	0	1.0
27...	43	4.1	1.3	44	8.0	10.6	0	2.0
AUG.								
03...	43	2.2	1.0	44	7.9	7.2	0	.0
04-06	--	--	--	--	--	--	--	--
10...	44	2.3	1.0	45	7.8	7.8	0	2.0
24...	43	3.1	1.3	45	7.8	8.0	0	.0
25...	44	2.3	1.0	45	7.8	7.0	0	2.0
31...	44	2.9	1.5	45	8.1	12.0	0	1.0
SEPT.								
07-09	--	--	--	--	--	--	--	--
08...	43	3.1	1.3	45	8.0	14.0	5	2.0
14...	44	3.1	1.5	45	8.0	14.0	0	1.0
21...	43	3.2	1.3	45	7.7	5.6	0	1.0
28...	44	2.3	1.3	45	7.9	6.1	5	2.0

04015380 LAKE SUPERIOR AT DULUTH, MINN.--Continued

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	DIS-SOLVED OXYGEN (MG/L)	BIO-CHEM-ICAL OXYGEN DEMAND (MG/L)	COLI-FORM (MPN)	SPECI-FIC COND-UCTANCE (MICRO-MHOS)	SAMPLE SIZE (GALS)	TOTAL CARBON EX-TRACT ABLES (UG/L)	CARBON CHLORO-FORM EX-TRACT ABLES (UG/L)	CARBON ALCOHOL EX-TRACT ABLES (UG/L)
APR.								
13...	13.8	.3	0	105	--	--	--	--
20...	13.8	.3	2	98	--	--	--	--
27...	13.2	.2	0	98	--	--	--	--
MAY								
04...	12.2	.3	0	110	--	--	--	--
04-05	--	--	--	--	1065	268	37	231
11...	12.1	.3	13	92	--	--	--	--
18...	13.5	1.0	0	98	--	--	--	--
25...	13.5	.5	0	100	--	--	--	--
JUNE								
01...	12.5	.2	1	85	--	--	--	--
01-03	--	--	--	--	1590	192	32	160
08...	12.5	.2	0	95	--	--	--	--
08...	--	--	--	--	--	--	--	--
15...	12.7	.2	2	95	--	--	--	--
22...	12.9	.3	1	95	--	--	--	--
29...	12.1	.8	2	95	--	--	--	--
JULY								
06...	12.4	.3	0	100	--	--	--	--
06-08	--	--	--	--	1185	209	35	174
13...	--	--	--	--	--	--	--	--
20...	10.9	.5	4	93	--	--	--	--
27...	11.1	.4	10	93	--	--	--	--
AUG.								
03...	12.1	.5	2	90	--	--	--	--
04-06	--	--	--	--	1080	177	28	149
10...	11.7	.4	2	110	--	--	--	--
24...	12.2	.5	1	90	--	--	--	--
25...	11.7	.4	2	110	--	--	--	--
31...	11.3	.7	1	90	--	--	--	--
SEPT.								
07-09	--	--	--	--	1035	232	33	199
08...	10.5	.6	1	90	--	--	--	--
14...	10.2	.7	18	90	--	--	--	--
21...	12.1	.2	4	90	--	--	--	--
28...	12.1	.3	2	95	--	--	--	--

05033800 CAMPBELL CREEK NEAR DETROIT LAKES, MINN.

LOCATION.--Lat 46°53'29", long 95°51'57", on line between sec.4, T.139 N., R.41 W., and sec.33. T.140 N., R.41 W., Becker County, on upstream side of culvert on county road 5 miles north of city of Detroit Lakes.
PERIOD OF RECORD.--Chemical analyses: July 1969 to current year.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	DIS-CHARGE (CFS)	SILICA (SIO2) (MG/L)	DIS-SOLVED ALUM-INUM (AL) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	PO-TAS-SIUM (K) (MG/L)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	ALKA-LINITY AS CACO3 (MG/L)
OCT.												
09...	.16	24	502	49	0	85	40	3.5	9.5	382	0	313
NOV.												
13...	1.2	14	396	34	7	56	33	2.7	4.4	278	0	228
DEC.												
15...	.10	28	394	51	17	88	53	4.2	5.8	451	0	370
MAR.												
30...	.10	17	556	142	32	77	34	3.0	8.8	217	0	178
APR.												
27...	15	19	392	92	28	55	22	1.8	7.3	209	0	171
JUNE												
02...	1.9	17	647	185	173	99	41	3.2	7.8	273	0	224
30...	5.4	20	--	165	72	70	34	2.7	5.8	290	0	238

DATE	DIS-SOLVED SOLIDS (TONS PER AC-FT)	DIS-SOLVED SOLIDS (TONS PER DAY)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	SPECI-FIC COND-UCTANCE (MICRO-MHOS)	PH (UNITS)	TEMP-ERATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)
OCT.										
09...	.65	.21	375	61	2	.1	672	7.8	7.0	50
NOV.										
13...	.44	1.07	273	45	2	.1	490	7.8	.0	37
DEC.										
15...	.69	.14	438	68	2	.1	740	8.0	.0	23
MAR.										
30...	.72	.14	330	152	2	.1	646	7.7	.0	45
APR.										
27...	.43	12.8	228	56	2	.1	440	8.1	14.0	26
JUNE										
02...	.76	2.92	416	192	2	.1	730	8.1	11.0	80
30...	.59	6.36	313	75	2	.1	559	7.9	24.0	48

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	SULFATE (SO4) (MG/L)	CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	NITRATE (N) (MG/L)	NITRATE (NO3) (MG/L)	DIS-SOLVED ORTHO PHOS-PHATE (PO4) (MG/L)	DIS-SOL-VED PHOS-PHORUS (P) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	TOTAL ORTHO PHOS-PHOSUS (P) (MG/L)	DIS-SOLVED BORON (B) (UG/L)	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)
OCT.												
09...	69	4.2	.3	.03	.1	.18	.08	--	--	83	479	424
NOV.												
13...	40	4.2	.2	.04	.2	.04	.02	--	--	53	326	291
DEC.												
15...	64	6.0	.2	.12	.5	.00	.03	--	--	52	506	472
MAR.												
30...	135	4.6	.2	5.4	24	1.1	.41	.42	.35	15	529	412
APR.												
27...	52	4.8	.3	2.9	13	--	--	.10	--	40	314	278
JUNE												
02...	184	3.8	.6	1.7	7.7	--	--	.09	--	112	561	500
30...	77	2.4	.3	.35	1.5	--	--	.08	--	36	432	358

05033810 FLOYD LAKE OUTLET NEAR DETROIT LAKES, MINN.

LOCATION.--Lat 46°52'42", long 95°50'23", in SE¼SE¼ sec.3, T.139 N., R.41 W., Becker County, on upstream side of culvert on County Highway 21, 3.7 miles northeast of city of Detroit Lakes.
PERIOD OF RECORD.--Chemical analyses: December 1969 to September 1970.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	DIS-CHARGE (CFS)	SILICA (SIO2) (MG/L)	DIS-SOLVED ALUM-INUM (AL) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	PO-TAS-SIUM (K) (MG/L)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	ALKA-LINITY AS CACO3 (MG/L)
DEC.												
15...	.22	17	260	34	14	32	36	3.2	5.4	242	0	198
JAN.												
19...	.35	19	227	76	268	33	38	3.4	5.8	260	0	213
FEB.												
24...	.17	19	298	57	202	36	37	3.1	5.8	260	0	213
MAR.												
30...	.20	19	410	43	36	32	36	3.2	5.8	257	0	211
APR.												
27...	11	18	264	10	C	32	34	4.2	7.8	240	0	197
JUNE												
02...	10	10	269	0	8	35	30	2.9	6.7	224	0	184
30...	11	8.5	--	28	12	33	30	2.7	5.0	215	0	176
AUG.												
03...	.19	18	--	81	57	27	30	3.0	4.9	199	0	163

DATE	SULFATE (SO4) (MG/L)	CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	NITRATE (N) (MG/L)	NITRATE (NO3) (MG/L)	DIS-SOLVED ORTHO PHOS-PHATE (PO4) (MG/L)	DIS-SOL-VED PHOS-PHORUS (P) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	TOTAL ORTHO PHOS-PHOSUS (P) (MG/L)	DIS-SOLVED BORON (B) (UG/L)	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)
DEC.												
15...	34	3.6	.2	.38	1.7	.05	.02	--	--	53	261	252
JAN.												
19...	36	4.0	.2	.01	.1	.02	.01	--	--	53	268	268
FEB.												
24...	33	4.0	.2	.01	.1	.10	.04	.04	.03	.01	313	267
MAR.												
30...	35	3.2	.2	.02	.1	.02	.01	.10	.01	4.2	284	261
APR.												
27...	33	4.0	.4	.23	1.0	--	--	.03	--	43	256	253
JUNE												
02...	33	3.6	.2	.01	.0	--	--	.01	--	37	241	232
30...	34	2.1	.0	.04	.2	--	--	.00	--	23	245	222
AUG.												
03...	34	2.9	.0	.28	1.2	--	--	.03	--	28	235	220

DATE	DIS-SOLVED SOLIDS (TONS PER AC-FT)	DIS-SOLVED SOLIDS (TONS PER DAY)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	SPECI-FIC COND-UCTANCE (MICRO-MHOS)	PH (UNITS)	TEMP-ERATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)
DEC.										
15...	.35	.16	226	27	3	.1	429	7.7	0.0	7
JAN.										
19...	.36	.25	239	25	3	.1	452	7.7	0.0	40
FEB.										
24...	.43	.14	243	30	3	.1	457	8.0	0.0	10
MAR.										
30...	.39	.15	229	18	3	.1	447	8.3	0.0	10
APR.										
27...	.35	7.60	219	22	4	.1	418	8.1	5.0	1
JUNE										
02...	.33	6.77	211	27	3	.1	403	8.1	13.0	9
30...	.33	7.47	206	30	3	.1	394	7.7	23.5	8
AUG.										
03...	.32	.12	192	29	3	.1	370	7.6	22.0	7

05039100 PELICAN RIVER AT LAKE MELISSA OUTLET NEAR DETROIT LAKES, MINN.

LOCATION.--Lat 46°43'50", long 95°53'40", in NW¼ sec.32, T.138 N., R.41 W., Becker County, at gaging station on left bank 50 ft downstream from Lake Melissa, 400 ft upstream from culvert on county road and 6 miles southwest of city of Detroit Lakes.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	DIS-CHARGE (CFS)	SILICA (SIO2) (MG/L)	DIS-SOLVED ALUM-INUM (AL) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	PO-TAS-SIUM (K) (MG/L)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	ALKA-LINITY AS CACO3 (MG/L)
OCT.												
09...	.10	7.7	280	82	56	36	33	14	8.5	279	0	229
NOV.												
12...	.10	14	279	42	0	24	31	12	4.8	222	0	182
DEC.												
16...	11	16	277	11	9	24	32	13	5.3	228	0	187
JAN.												
20...	16	15	259	30	0	24	34	15	5.0	239	0	196
FEB.												
25...	14	16	303	89	0	23	35	14	5.3	244	0	200
MAR.												
31...	26	16	245	115	9	25	34	14	5.4	247	0	203
APR.												
28...	71	19	267	31	29	26	20	7.4	4.9	177	0	145
JUNE												
02...	71	11	281	0	0	27	29	12	6.3	224	0	184
JULY												
01...	75	8.4	--	30	32	25	29	11	4.7	218	0	178
AUG.												
04...	4.6	11	--	38	12	20	29	9.9	4.8	200	0	164
SEPT.												
01...	.10	12	--	79	37	22	31	13	5.4	227	0	186

DATE	DIS-SOLVED SOLIDS (TONS PER AC-FT)	DIS-SOLVED SOLIDS (TONS PER DAY)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	SPECI-FIC COND-UCTANCE (MICRO-MHOS)	PH (UNITS)	TEMP-ERATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)
OCT.										
09...	.40	.08	225	0	11	.4	466	7.9	12.0	45
NOV.										
12...	.32	.06	186	5	12	.4	391	7.8	3.0	4
DEC.										
16...	.33	7.13	191	4	12	.4	406	7.7	.0	6
JAN.										
20...	.33	10.6	200	4	14	.5	426	7.6	.0	3
FEB.										
25...	.36	--	199	0	13	.4	441	7.9	1.0	15
MAR.										
31...	.37	19.2	201	0	13	.4	451	8.1	2.0	3
APR.										
28...	.24	34.7	147	2	9	.3	313	8.2	7.0	1
JUNE										
02...	.31	44.2	186	2	12	.4	396	8.3	16.0	4
JULY										
01...	.30	45.0	180	1	11	.4	384	7.8	24.0	7
AUG.										
04...	.29	2.71	170	6	11	.3	366	7.7	22.0	4
SEPT.										
01...	.32	.06	183	0	13	.4	401	7.9	19.0	14

05039100 PELICAN RIVER AT LAKE MELISSA OUTLET NEAR DETROIT LAKES, MINN.--Continued

PERIOD OF RECORD.--Chemical analyses: August 1968 to current year.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	SULFATE (SO4) (MG/L)	CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	NITRATE (N) (MG/L)	NITRATE (NO3) (MG/L)	DIS-SOLVED ORTHO PHOS-PHATE (PO4) (MG/L)	DIS-SOL-VED PHOS-PHORUS (P) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	TOTAL ORTHO PHOS-PHORUS (P) (MG/L)	DIS-SOLVED BORON (B) (UG/L)	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)
OCT.												
09...	15	11	.4	.00	.0	.05	.03	--	--	65	292	263
NOV.												
12...	17	13	.2	.01	.0	.01	.01	--	--	48	232	226
DEC.												
16...	17	13	.2	.00	.0	.02	.01	--	--	57	240	234
JAN.												
20...	17	14	.2	.01	.0	.01	.02	--	--	63	246	243
FEB.												
25...	18	11	.1	.00	.0	.06	.03	.04	.02	12	262	242
MAR.												
31...	20	12	.2	.03	.1	.04	.02	.06	.01	15	269	250
APR.												
28...	10	5.4	.3	.01	.1	--	--	.02	--	29	180	181
JUNE												
02...	16	13	.3	.00	.0	--	--	.03	--	49	230	224
JULY												
01...	15	12	.2	.02	.1	--	--	.00	--	40	222	212
AUG.												
04...	15	13	.2	.41	1.8	--	--	.00	--	55	215	203
SEPT.												
01...	12	7.8	.2	.32	1.4	--	--	.05	--	20	238	218

05082200 RED LAKE RIVER AT EAST GRAND FORKS, MINN.

LOCATION.--Lat 47°55'24", long 97°00'59", in SW¼SW¼ sec.1, T.151 N., R.50 W., Polk County, at bridge on State Highway 220 at south edge of East Grand Forks and 0.2 mile upstream from mouth.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	DIS-CHARGE (CFS)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	ALKA-LINITY AS CACO3 (MG/L)	SULFATE (SO4) (MG/L)	CHLO-RIDE (CL) (MG/L)	NITRITE (N) (MG/L)	NITRITE (NO2) (MG/L)	AMMONIA NITRO-GEN (N) (MG/L)
OCT.									
16...	1500	230	0	189	34	3.2	.00	.01	.00
16...	1500	--	--	--	--	--	--	--	--
NOV.									
19...	789	227	0	186	25	4.8	.00	.00	.02
19...	789	--	--	--	--	--	--	--	--
DEC.									
17...	922	219	0	180	17	6.0	.00	.01	.04
17...	922	--	--	--	--	--	--	--	--
JAN.									
13...	600	--	--	--	--	--	--	--	--
21...	1140	220	0	181	15	2.6	.00	.01	.10
FEB.									
19...	1000	208	0	171	16	2.6	.00	.02	.10
MAR.									
18...	920	207	0	170	13	2.8	.00	.03	.03
18...	920	--	--	--	--	--	--	--	--
APR.									
16...	--	168	0	138	32	7.8	.10	.24	.33
16...	8760	--	--	--	--	--	--	--	--
MAY									
14...	3600	203	0	167	54	2.0	.00	.00	.01
14...	3600	--	--	--	--	--	--	--	--
14...	3800	--	--	--	--	--	--	--	--
JUNE									
24...	5290	200	0	164	74	3.1	.00	.06	.02
24...	5280	--	--	--	--	--	--	--	--
JULY									
22...	890	--	--	--	29	3.4	--	--	.04
AUG.									
18...	869	--	--	--	17	3.8	--	--	.07
18...	860	--	--	--	--	--	--	--	--
SEPT.									
16...	970	--	--	--	--	--	--	--	--
16...	969	--	--	--	13	2.8	--	--	.03

05082200 RED LAKE RIVER AT EAST GRAND FORKS, MINN.--Continued

DRAINAGE AREA.--5,655 sq mi, approximately.
PERIOD OF RECORD.--Chemical analyses: August 1969 to current year.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	NITRATE (N) (MG/L)	NITRATE (NO3) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	DIS-SOL-VED-PHOS-PHORUS (P) (MG/L)	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)	DIS-SOLVED SOLIDS (TONS PER AC-FT)	DIS-SOLVED SOLIDS (TONS PER DAY)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)
OCT.									
16...	.10	.3	2.8	.40	253	.34	1030	211	23
16...	--	--	--	--	--	--	--	--	--
NOV.									
19...	.00	.1	.98	.24	253	.34	539	219	33
19...	--	--	--	--	--	--	--	--	--
DEC.									
17...	.00	.1	.05	.04	226	.31	563	186	7
17...	--	--	--	--	--	--	--	--	--
JAN.									
13...	--	--	--	--	--	--	--	--	--
21...	.10	.3	.30	.05	173	.24	532	187	6
FEB.									
19...	.10	.4	.07	.06	224	.30	605	177	7
MAR.									
18...	.10	.5	.11	.11	217	.30	539	182	12
18...	--	--	--	--	--	--	--	--	--
APR.									
16...	2.1	9.1	.58	.29	201	.27	--	134	0
16...	--	--	--	--	--	--	--	--	--
MAY									
14...	.10	.4	.26	.02	280	.38	2720	216	49
14...	--	--	--	--	--	--	--	--	--
14...	--	--	--	--	--	--	--	--	--
JUNE									
24...	.09	.4	.27	.09	312	.42	4460	230	66
24...	--	--	--	--	--	--	--	--	--
JULY									
22...	.05	.2	.17	--	250	.34	601	199	--
AUG.									
18...	--	--	.13	--	225	.31	528	176	--
18...	--	--	--	--	--	--	--	--	--
SEPT.									
16...	--	--	--	--	--	--	--	--	--
16...	.03	.1	.13	--	209	.28	547	153	--

05082200 RED LAKE RIVER AT EAST GRAND FORKS, MINN.--Continued

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	SODIUM (NA) (MG/L)	SODIUM AD-SORP-TION RATIO	PERCENT SODIUM	PO-TAS-SIUM (K) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	ORGANIC NITRO-GEN (N) (MG/L)	COLOR (PLAT-INUM-COBALT UNITS)	DIS-SOLVED ARSENIC (AS) (UG/L)
OCT.										
16...	--	--	6.6	.2	6	3.3	.2	--	18	2
APR.										
16...	--	--	--	--	--	--	--	2.1	--	--
MAY										
14...	--	--	3.1	.1	3	4.5	--	--	35	7
JUNE										
24...	--	--	6.1	.2	5	3.8	.3	--	60	0
JULY										
22...	18	50	--	--	--	--	--	--	--	--
AUG.										
18...	17	43	--	--	--	--	--	--	--	--
SEPT.										
16...	14	38	4.4	.2	6	--	.1	--	--	4

DATE	DIS-SOLVED BARIUM (BA) (UG/L)	DIS-SOLVED BERYL-LIUM (BE) (UG/L)	DIS-SOLVED BORON (B) (UG/L)	DIS-SOLVED CAD-MIUM (CD) (UG/L)	DIS-SOLVED COBALT (CO) (UG/L)	DIS-SOLVED COPPER (CU) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	DIS-SOLVED LEAD (PB) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	DIS-SOLVED MOLY-BDENUM (MO) (UG/L)
OCT.										
16...	0	--	57	0	0	5	14	0	8	5
APR.										
16...	--	--	--	--	--	--	--	--	--	--
MAY										
14...	0	0	53	0	0	45	98	0	21	0
JUNE										
24...	0	0	90	0	0	25	38	0	0	10
JULY										
22...	--	--	--	--	--	--	--	--	--	--
AUG.										
18...	--	--	--	--	--	--	--	--	--	--
SEPT.										
16...	--	0	21	1	--	0	--	0	17	4

05082200 RED LAKE RIVER AT EAST GRAND FORKS, MINN.--Continued

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE (DEG C)	TURBIDITY (JTU)	BIOCHEMICAL OXYGEN DEMAND (MG/L)	METHYLENE BLUE ACTIVE SUBSTANCE (MG/L)
OCT.						
16...	400	8.3	6.0	24	2.4	.00
16...	408	7.5	6.0	--	--	--
NOV.						
19...	337	7.7	.0	10	8.1	.02
19...	380	8.0	.0	--	--	--
DEC.						
17...	361	8.3	1.0	6.0	8.2	.09
17...	360	7.2	.0	--	--	--
JAN.						
13...	382	8.3	.0	--	--	--
21...	352	7.7	.0	5.0	5.4	.00
FEB.						
19...	360	8.0	.0	4.0	1.2	.00
MAR.						
18...	334	7.9	.0	3.0	1.0	.04
18...	308	7.7	.3	--	--	--
APR.						
16...	290	7.7	1.0	80	6.9	.00
MAY						
14...	420	7.9	7.0	75	7.8	.03
14...	415	11.0	7.5	--	--	--
14...	415	10.7	7.5	--	--	--
JUNE						
24...	444	7.9	21.0	45	2.8	.04
24...	455	7.5	--	--	--	--
JULY						
22...	--	--	22.0	--	1.8	--
AUG.						
18...	380	8.4	21.0	--	1.7	--
18...	300	8.1	22.5	--	--	--
SEPT.						
16...	305	9.7	13.0	--	--	--
16...	--	--	13.0	--	2.7	--

DATE	DISSOLVED NICKEL (NI) (UG/L)	DISSOLVED SILVER (AG) (UG/L)	DISSOLVED STRONTIUM (SR) (UG/L)	DISSOLVED VANADIUM (V) (UG/L)	DISSOLVED ZINC (ZN) (UG/L)	DISSOLVED LITHIUM (LI) (UG/L)	DISSOLVED SELENIUM (SE) (UG/L)	DISSOLVED MERCURY (HG) (UG/L)
OCT.								
16...	0	0	20C	0	20	--	--	--
MAY								
14...	66	0	21B	0	46	12	--	--
JUNE								
24...	2	2	326	0	8	--	--	--
SEPT.								
16...	22	0	--	--	18	--	11	.0

05124480 KAWISHIWI RIVER NEAR ELY, MINN.

(Hydrologic bench-mark station)

LOCATION.--Lat 47°55'22", long 91°32'06", in SE¼ sec.24, T.63 N., R.10 W., Lake County, at gaging station, on left bank upstream from rapids, 2 miles upstream from South Kawishiwi River, 2.2 miles southwest of Fernberg Lookout Tower and 14 miles east of Ely.
DRAINAGE AREA.--253 sq mi.
RECORDS AVAILABLE.--Chemical analyses: October 1967 to September 1970
Water temperatures: July 1966 to September 1970

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	DIS-CHARGE (CFS)	SILICA (SIO2) (MG/L)	DIS-SOLVED ALUM-INUM (AL) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	PO-TAS-SIUM (K) (MG/L)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	ALKA-LINITY AS CACO3 (MG/L)
NOV.												
04...	148	3.4	438	199	9	3.2	1.3	1.1	.3	12	0	10
DEC.												
18...	166	--	--	--	--	--	--	--	--	--	--	--
18...	166	4.4	426	237	6	3.8	1.4	1.1	.2	12	0	10
JAN.												
29...	97	--	--	--	--	--	--	--	--	--	--	--
29...	97	4.4	456	266	12	3.7	1.4	1.1	.2	13	0	10
FEB.												
26...	69	4.6	496	230	10	3.3	1.5	1.1	.3	13	0	10
APR.												
01...	56	4.6	469	225	20	3.5	1.5	1.1	.3	13	0	11
MAY												
05...	1080	11	494	251	28	3.2	1.5	1.1	.3	14	0	11
26...	1270	5.5	--	278	20	3.0	1.4	1.6	.4	14	0	11
JULY												
24...	178	3.8	--	207	0	2.8	1.4	1.5	.3	14	0	11

05124480 KAWISHIWI RIVER NEAR ELY, MINN.--Continued

(Hydrologic bench-mark station)

EXTREMES, 1969-70.--Water temperatures: Maximum, 21°C July 11 to Aug. 3; minimum, 1°C on many days during winter months.
EXTREMES, 1966-70.--Water temperatures: Maximum, 24°C July 24, 25, 1966; minimum, freezing point on many days during winter months.
REMARKS.--Recorder stopped Sept. 10-23; range in temperature, 19°C to 14°C.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	SULFATE (SO4) (MG/L)	CHLORIDE (CL) (MG/L)	DISSOLVED FLUORIDE (F) (MG/L)	NITRATE (N) (MG/L)	NITRATE (NO3) (MG/L)	DISSOLVED ORTHO PHOSPHATE (PO4) (MG/L)	DISSOLVED PHOSPHORUS (P) (MG/L)	TOTAL PHOSPHORUS (P) (MG/L)	TOTAL ORTHO PHOSPHOSUS (P) (MG/L)	DISSOLVED BORON (B) (UG/L)	DISSOLVED SOLIDS (RESIDUE AT 180 C) (MG/L)	DISSOLVED SOLIDS (SUM OF CONSTITUENTS) (MG/L)
NOV.												
04...	5.7	.3	.3	.03	.1	.04	.02	--	--	33	37	23
DEC.												
18...	--	--	--	--	--	--	--	--	--	--	--	--
18...	8.5	.1	.2	.03	.1	.02	.01	--	--	29	31	26
JAN.												
29...	--	--	--	--	--	--	--	--	--	--	--	--
29...	5.5	.5	.2	.04	.2	.06	.03	--	--	34	32	24
FEB.												
26...	5.2	.2	.0	.04	.2	.10	.04	.04	.03	.01	35	24
APR.												
01...	5.5	.6	.1	.04	.2	.13	.05	.06	.04	.01	40	25
MAY												
05...	6.2	.4	.1	.04	.2	.23	.08	.12	.07	.01	32	31
26...	4.2	.0	.1	.03	.1	--	--	.04	--	3.2	40	23
JULY												
24...	4.3	.0	.1	.02	.1	--	--	.00	--	4.2	41	21

05124480 KAWISHIWI RIVER NEAR ELY, MINN.--Continued

(Hydrologic bench-mark station)

TEMPERATURE (°C) OF WATER, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970
(WATER-STAGE RECORDER WITH TEMPERATURE ATTACHMENT)

DAY	OCT		NOV		DEC		JAN		FEB		MAR	
	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1	13.0	12.0	4.0	4.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
2	12.0	12.0	4.0	4.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
3	12.0	12.0	4.0	4.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
4	12.0	12.0	4.0	3.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
5	12.0	12.0	3.0	3.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
6	12.0	12.0	3.0	3.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
7	12.0	12.0	3.0	3.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
8	12.0	11.0	3.0	3.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
9	11.0	11.0	3.0	3.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
10	11.0	11.0	3.0	3.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
11	11.0	11.0	3.0	3.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
12	11.0	10.0	3.0	3.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
13	10.0	9.0	3.0	3.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
14	9.0	9.0	3.0	3.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
15	9.0	8.0	3.0	3.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
16	8.0	8.0	3.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
17	8.0	8.0	2.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0
18	8.0	7.0	2.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
19	7.0	7.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
20	7.0	7.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
21	7.0	6.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
22	6.0	6.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
23	6.0	6.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
24	6.0	5.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
25	5.0	5.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
26	5.0	4.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
27	4.0	4.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
28	4.0	4.0	2.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
29	4.0	4.0	2.0	2.0	1.0	1.0	1.0	1.0	--	--	1.0	1.0
30	4.0	4.0	2.0	2.0	1.0	1.0	1.0	1.0	--	--	1.0	1.0
31	4.0	4.0	--	--	1.0	1.0	1.0	1.0	--	--	1.0	1.0
AVG	8.5	8.2	2.7	2.6	1.6	1.5	1.0	1.0	1.0	1.0	1.0	1.0

05124480 KAWISHIWI RIVER NEAR ELY, MINN.--Continued

(Hydrologic bench-mark station)

TEMPERATURE (°C) OF WATER, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970
(WATER-STAGE RECORDER WITH TEMPERATURE ATTACHMENT)

DAY	APR		MAY		JUN		JUL		AUG		SEP	
	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1	1.0	1.0	4.0	4.0	9.0	9.0	19.0	18.0	21.0	21.0	18.0	17.0
2	1.0	1.0	4.0	4.0	10.0	9.0	19.0	19.0	21.0	21.0	18.0	18.0
3	1.0	1.0	4.0	4.0	11.0	10.0	19.0	19.0	21.0	20.0	18.0	18.0
4	1.0	1.0	5.0	4.0	11.0	11.0	19.0	19.0	20.0	19.0	18.0	18.0
5	1.0	1.0	5.0	5.0	12.0	11.0	19.0	19.0	19.0	19.0	19.0	19.0
6	1.0	1.0	5.0	5.0	13.0	12.0	19.0	19.0	19.0	19.0	19.0	19.0
7	1.0	1.0	6.0	5.0	14.0	13.0	19.0	19.0	19.0	19.0	19.0	19.0
8	1.0	1.0	6.0	6.0	15.0	14.0	19.0	19.0	19.0	19.0	19.0	19.0
9	1.0	1.0	6.0	6.0	16.0	15.0	19.0	19.0	19.0	19.0	19.0	19.0
10	1.0	1.0	6.0	6.0	16.0	16.0	20.0	19.0	19.0	19.0	--	--
11	1.0	1.0	6.0	6.0	16.0	16.0	21.0	20.0	19.0	19.0	--	--
12	1.0	1.0	6.0	6.0	16.0	16.0	21.0	21.0	19.0	19.0	--	--
13	1.0	1.0	6.0	6.0	17.0	16.0	21.0	21.0	19.0	19.0	--	--
14	2.0	1.0	6.0	6.0	17.0	17.0	21.0	21.0	20.0	19.0	--	--
15	2.0	2.0	6.0	6.0	17.0	17.0	21.0	21.0	20.0	20.0	--	--
16	2.0	2.0	6.0	6.0	17.0	17.0	21.0	21.0	20.0	19.0	--	--
17	2.0	2.0	6.0	6.0	17.0	17.0	21.0	21.0	19.0	19.0	--	--
18	2.0	2.0	7.0	6.0	17.0	17.0	21.0	21.0	19.0	19.0	--	--
19	2.0	2.0	8.0	7.0	17.0	17.0	21.0	21.0	19.0	19.0	--	--
20	2.0	2.0	8.0	7.0	17.0	17.0	21.0	21.0	19.0	19.0	--	--
21	3.0	2.0	8.0	7.0	17.0	17.0	21.0	21.0	19.0	18.0	--	--
22	3.0	3.0	8.0	8.0	17.0	17.0	21.0	21.0	19.0	18.0	--	--
23	3.0	3.0	9.0	8.0	17.0	17.0	21.0	21.0	19.0	18.0	--	--
24	3.0	3.0	9.0	9.0	17.0	17.0	21.0	21.0	19.0	18.0	14.0	14.0
25	3.0	3.0	9.0	9.0	17.0	17.0	21.0	21.0	18.0	18.0	14.0	14.0
26	3.0	3.0	9.0	9.0	17.0	17.0	21.0	21.0	18.0	18.0	14.0	14.0
27	3.0	3.0	9.0	9.0	17.0	17.0	21.0	21.0	18.0	17.0	14.0	13.0
28	3.0	3.0	9.0	9.0	17.0	17.0	21.0	21.0	17.0	17.0	13.0	13.0
29	3.0	3.0	9.0	9.0	17.0	17.0	21.0	21.0	17.0	17.0	13.0	13.0
30	4.0	3.0	9.0	9.0	18.0	17.0	21.0	21.0	17.0	17.0	13.0	13.0
31	--	--	9.0	9.0	--	--	21.0	21.0	17.0	17.0	--	--
AVG	1.9	1.8	6.9	6.6	15.5	15.2	20.4	20.3	19.0	18.7	--	--

05316770 MINNESOTA RIVER AT NEW ULM, MINN.

LOCATION.--Lat 44°19'29", long 94°27'09", in NE¼NE¼ sec.20, T.110 N., R.30 W., Nicollet County, at gaging station on left bank, 30 ft downstream from bridge on U.S. Highway 14 at New Ulm, and 6.1 miles upstream from Cottonwood River.
DRAINAGE AREA.--9,530 sq mi, approximately.
PERIOD OF RECORD.--Water temperatures: October 1967 to current year.
Sediment records: October 1967 to current year.
EXTREMES, current year.--Water temperatures: Maximum, 24°C on several days in June, July, and August; minimum, freezing point on many days during winter period.
Sediment concentrations: Maximum daily, 598 mg/l June 18; minimum daily, 8 mg/l Feb. 15, 16.
Sediment loads: Maximum daily, 6,960 tons June 19; minimum daily, 6.9 tons Feb. 15, 16.
EXTREMES, period of record.--Water temperatures: Maximum, 26°C July 15, 16, Aug. 23, 1968, July 15, 16, 1969; minimum, freezing point on many days during winter period.
Sediment concentrations: Maximum daily, 598 mg/l June 18, 1970; minimum daily, 8 mg/l Feb. 15, 16, 1970.
Sediment loads: Maximum daily, 34,200 tons Apr. 13, 1969; minimum daily, 6.9 tons Feb. 15, 16, 1970.
REMARKS.--Flow affected by ice during winter period.

TEMPERATURE (°C) OF WATER, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970
(ONCE-DAILY MEASUREMENT, BETWEEN 0700 AND 1200)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	15.0	4.0	--	--	--	--	--	12.0	17.0	24.0	24.0	20.0
2	14.0	4.0	--	--	--	--	--	12.0	16.0	24.0	24.0	19.0
3	14.0	4.0	--	0.0	--	--	--	12.0	16.0	24.0	24.0	20.0
4	15.0	3.0	--	--	--	--	0.0	13.0	17.0	22.0	22.0	21.0
5	15.0	3.0	--	--	--	--	--	11.0	19.0	21.0	22.0	20.0
6	11.0	4.0	0.0	--	--	2.0	--	11.0	19.0	21.0	22.0	23.0
7	12.0	5.0	--	--	0.0	0.0	--	12.0	20.0	22.0	22.0	23.0
8	10.0	6.0	--	--	--	--	0.0	14.0	21.0	22.0	21.0	22.0
9	10.0	7.0	--	--	--	--	1.0	14.0	22.0	21.0	21.0	20.0
10	10.0	7.0	--	0.0	--	--	4.0	15.0	22.0	21.0	21.0	20.0
11	10.0	5.0	--	--	--	--	4.0	15.0	23.0	23.0	22.0	20.0
12	10.0	5.0	--	--	--	--	4.0	15.0	23.0	24.0	22.0	19.0
13	9.0	1.0	0.0	--	--	--	4.0	13.0	21.0	22.0	23.0	18.0
14	5.0	1.0	--	--	0.0	0.0	4.0	13.0	21.0	22.0	23.0	17.0
15	6.0	1.0	--	--	--	--	5.0	11.0	21.0	22.0	24.0	12.0
16	6.0	0.0	--	--	--	--	6.0	11.0	21.0	21.0	23.0	12.0
17	5.0	0.0	--	0.0	--	--	5.0	11.0	21.0	22.0	23.0	10.0
18	4.0	0.0	--	--	--	--	5.0	12.0	20.0	24.0	23.0	10.0
19	6.0	--	--	--	--	--	5.0	15.0	21.0	23.0	22.0	16.0
20	6.0	--	0.0	--	--	--	4.0	15.0	19.0	20.0	19.0	18.0
21	6.0	--	--	--	0.0	0.0	4.0	17.0	18.0	20.0	19.0	18.0
22	6.0	1.0	--	--	--	--	4.0	17.0	20.0	21.0	19.0	16.0
23	5.0	--	--	--	--	--	4.0	17.0	20.0	20.0	18.0	16.0
24	5.0	--	--	0.0	--	--	4.0	17.0	20.0	20.0	18.0	16.0
25	6.0	--	--	--	--	--	4.0	17.0	20.0	22.0	20.0	15.0
26	4.0	--	--	--	--	--	7.0	15.0	20.0	23.0	20.0	11.0
27	4.0	--	0.0	--	--	--	10.0	14.0	20.0	24.0	21.0	12.0
28	1.0	--	--	--	0.0	0.0	12.0	14.0	21.0	24.0	21.0	12.0
29	2.0	0.0	--	--	1.0	--	15.0	16.0	21.0	24.0	21.0	12.0
30	4.0	--	--	--	--	--	13.0	17.0	24.0	24.0	20.0	12.0
31	4.0	--	--	0.0	--	--	--	16.0	--	24.0	20.0	--
AVG	7.7	--	--	--	--	--	5.3	14.0	20.1	22.3	21.4	16.6

INSTANTANEOUS SUSPENDED SEDIMENT AND PARTICLE SIZE, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970
(METHODS OF ANALYSIS: B, BOTTOM WITHDRAWAL TUBE; C, CHEMICALLY DISPERSED; N, IN NATIVE WATER; P, PIPET; S, SIEVE; V, VISUAL ACCUMULATION TUBE; W, IN DISTILLED WATER)

DATE	TIME	WATER TEMPERATURE (°C)	DISCHARGE (CFS)	CONCENTRATION (MG/L)	SUSPENDED SEDIMENT DISCHARGE (TONS/DAY)	PARTICLE SIZE: PERCENT FINER THAN THE SIZE (IN MILLIMETERS) INDICATED .002	.004	.008	.016	.031	.062	.125	.250	.500	1.00	2.00	METHOD OF ANALYSIS
MAY 28, 1970	0800	14	2190	339	2000	63	80	89	93	95	99	--	--	--	--	--	SVWC
JUN 16.....	0800	21	2700	218	1590	74	77	83	87	91	97	--	--	--	--	--	SPWC
JUN 17.....	0800	21	3160	250	2130	64	84	86	88	90	96	--	--	--	--	--	SPWC
JUL 13.....	0800	22	1070	124	358	64	81	84	89	94	97	--	--	--	--	--	SPWC
SEP 4.....	0800	21	298	142	114	30	40	48	55	63	78	--	--	--	--	--	SPWC

PARTICLE SIZE OF BED MATERIAL, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970
(METHOD OF ANALYSIS: H, HYDROMETER; O, OPTICAL ANALYZER; S, SIEVE; V, VISUAL ACCUMULATION TUBE)

DATE	TIME	WATER TEMPERATURE (°C)	NUMBER OF SAMPLING POINTS	DISCHARGE (CFS)	PARTICLE SIZE: PERCENT FINER THAN THE SIZE (IN MILLIMETERS) INDICATED .062	.125	.250	.500	1.00	2.00	4.00	8.00	16.0	32.0	64.0	METHOD OF ANALYSIS
OCT 9, 1969	1230	15	4	207	--	--	--	1	16	33	50	70	--	--	--	S
APR 9, 1970	1430	7	4	2500	15	22	31	51	63	67	73	85	--	--	--	S
JUN 19.....	1200	21	4	4500	18	24	37	48	59	66	75	86	--	--	--	S

05316770 MINNESOTA RIVER AT NEW ULM, MINN.--Continued

SUSPENDED-SEDIMENT DISCHARGE, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

	OCTOBER			NOVEMBER			DECEMBE		
DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
1	223	173	104	230	134	83	250	65	44
2	212	140	80	228	128	79	249	55	37
3	207	141	79	236	117	75	249	48	32
4	206	154	86	247	125	83	248	45	30
5	202	142	77	253	128	87	248	45	30
6	203	171	94	260	130	91	248	47	31
7	206	150	83	268	123	89	248	52	35
8	210	126	71	272	129	95	247	56	37
9	208	124	70	268	120	87	247	60	40
10	222	145	87	268	108	78	247	64	43
11	226	143	87	268	100	72	246	77	51
12	220	154	91	256	95	66	246	88	58
13	216	138	80	240	106	69	246	94	62
14	208	94	53	232	91	57	246	95	63
15	212	128	73	230	70	43	245	94	62
16	222	75	45	234	58	37	245	95	63
17	218	87	51	238	58	37	244	103	68
18	220	107	64	223	55	33	244	115	76
19	222	120	72	222	64	38	244	133	88
20	224	118	71	230	84	52	243	144	94
21	222	120	72	236	115	73	243	133	87
22	236	116	74	240	146	95	242	105	69
23	218	125	74	245	155	103	241	82	53
24	218	106	62	250	153	103	230	58	36
25	216	98	57	250	148	100	230	35	22
26	208	117	66	250	142	96	235	20	13
27	206	96	53	250	125	84	250	15	10
28	208	128	72	250	102	69	260	18	13
29	210	136	77	250	82	55	280	24	18
30	212	132	76	250	74	50	295	26	21
31	228	130	80	--	--	--	310	30	25
TOTAL	6669	--	2281	7378	--	2179	7746	--	1411

	JANUARY			FEBRUARY			MARCH		
DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
1	320	33	29	340	143	131	365	11	11
2	335	28	25	340	135	124	375	12	12
3	340	22	20	335	123	111	385	15	16
4	345	26	24	335	107	97	395	16	17
5	350	30	28	335	100	90	405	21	23
6	350	30	28	330	90	80	410	30	33
7	355	34	33	330	77	69	415	31	35
8	355	43	41	330	62	55	420	36	41
9	360	60	58	325	47	41	430	41	48
10	360	73	71	325	36	32	435	45	53
11	360	68	66	325	25	22	450	51	62
12	360	58	56	320	15	13	460	68	84
13	360	53	52	320	13	11	470	85	108
14	360	51	50	320	10	8.6	480	87	113
15	360	50	49	320	8	6.9	495	87	116
16	360	50	49	320	8	6.9	510	87	120
17	360	45	44	320	10	8.6	525	87	123
18	360	44	43	320	9	7.8	540	86	125
19	360	44	43	320	10	8.6	555	87	130
20	360	40	39	325	10	8.8	565	93	142
21	360	40	39	325	10	8.8	590	103	164
22	355	45	43	330	9	8.0	610	102	168
23	355	47	45	335	10	9.0	625	94	159
24	355	61	58	335	10	9.0	640	90	156
25	355	70	67	340	10	9.2	660	87	155
26	350	75	71	345	10	9.3	680	84	154
27	350	78	74	350	11	10	700	80	151
28	345	90	84	355	10	9.6	730	52	102
29	345	107	100	--	--	--	770	48	100
30	345	122	114	--	--	--	800	46	99
31	340	145	133	--	--	--	840	49	111
TOTAL	10925	--	1676	9250	--	1005.1	16730	--	2931

05316770 MINNESOTA RIVER AT NEW ULM, MINN.--Continued

SUSPENDED-SEDIMENT DISCHARGE, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

	APRIL			MAY			JUNE		
DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
1	880	53	126	4460	133	1600	2530	248	1690
2	930	60	151	4250	115	1320	2720	290	2130
3	1000	67	181	4070	118	1300	2720	266	1950
4	1080	82	239	3880	99	1040	2580	234	1630
5	1180	103	328	3970	108	1160	2520	225	1530
6	1280	111	384	3720	97	974	2500	204	1380
7	1560	118	497	3690	120	1200	2520	200	1360
8	2230	131	789	3450	141	1310	2500	173	1170
9	2510	197	1340	3230	208	1810	2510	158	1070
10	2560	250	1730	2990	161	1300	2510	152	1030
11	2550	235	1620	2820	166	1260	2360	138	879
12	2470	191	1270	2720	173	1270	2370	132	845
13	2410	117	761	2640	134	955	2530	153	1050
14	2250	110	668	2570	152	1050	2620	135	955
15	2240	118	714	2490	115	773	2660	156	1120
16	2360	120	765	2370	107	685	2700	146	1360
17	2470	125	834	2290	105	649	3160	235	2010
18	2530	117	799	2210	103	615	3870	598	6250
19	2600	166	1170	2110	110	627	4470	577	6960
20	2710	170	1240	2080	108	607	4910	205	2720
21	2960	165	1320	2030	112	614	5160	164	2280
22	3120	160	1350	2010	105	570	5320	162	2330
23	3470	111	1040	1980	158	845	5280	167	2380
24	3580	133	1290	1920	201	1040	5090	170	2340
25	3900	137	1440	1910	150	774	4780	161	2080
26	3970	212	2270	1860	154	773	4320	185	2160
27	4140	224	2500	1880	163	827	3830	225	2330
28	4250	220	2520	2190	343	2030	3450	225	2100
29	4300	205	2380	2460	298	1980	3160	263	2240
30	4360	193	2270	2460	285	1890	2920	262	2070
31	--	--	--	2530	245	1670	--	--	--
TOTAL	77850	--	33986	85240	--	34518	100570	--	61399

	JULY			AUGUST			SEPTEMBER		
DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
1	2720	267	1960	387	167	174	179	116	56
2	2570	296	2050	367	192	190	197	135	72
3	2380	279	1790	355	182	174	226	150	92
4	2260	253	1540	344	172	160	298	130	105
5	2120	247	1410	322	169	147	337	115	105
6	1990	217	1170	306	168	139	357	92	89
7	1740	167	785	295	137	109	332	83	74
8	1620	165	722	291	143	112	286	92	71
9	1350	137	499	278	148	111	249	182	122
10	1250	154	520	262	150	106	223	183	110
11	1070	118	341	266	132	95	202	102	56
12	962	108	281	339	154	141	184	47	23
13	1070	141	407	375	230	233	173	54	25
14	1170	151	477	368	130	129	168	60	27
15	1250	208	702	333	93	84	172	85	39
16	1300	163	572	304	90	74	170	64	29
17	1200	154	499	290	84	66	172	75	35
18	1030	155	431	284	87	67	172	63	29
19	854	190	438	282	95	72	177	97	46
20	742	190	381	257	92	64	184	104	52
21	672	179	325	236	86	55	188	89	45
22	626	165	279	220	100	59	186	155	78
23	602	157	255	210	100	57	181	146	71
24	581	197	309	201	101	55	176	136	65
25	555	155	232	193	91	47	172	123	57
26	521	140	197	186	105	53	174	134	63
27	489	148	195	181	111	54	180	149	72
28	465	156	196	177	141	67	180	153	74
29	450	141	171	174	145	68	182	161	79
30	443	158	189	173	155	72	184	182	90
31	412	183	204	172	120	56	--	--	--
TOTAL	36464	--	19527	8428	--	3090	6261	--	1951

TOTAL DISCHARGE FOR YEAR (CFS-DAYS) 373506
TOTAL SUSPENDED-SEDIMENT DISCHARGE FOR YEAR (TONS) 165954.1

05325000 MINNESOTA RIVER AT MANKATO, MINN.

LOCATION.--Lat 44°10'10", long 94°00'15", in sec.7, T.108 N., R.26 W., Nicollet County, at gaging station on left bank at downstream side of Main Street bridge at Mankato, 1.8 miles downstream from Blue Earth River and at mile 106.4 upstream from Mississippi River.
DRAINAGE AREA.--14,900 sq mi, approximately.
PERIOD OF RECORD.--Chemical analyses: October 1963 to August 1966.
Water temperatures: October 1967 to current year.
Sediment records: October 1967 to current year.
EXTREMES, current year.--Water temperatures: Maximum, 29°C July 1, 11, 28, 30; minimum, freezing point on many days during winter period.
Sediment concentrations: Maximum daily, 1,030 mg/l May 15; minimum daily, 19 mg/l Mar. 9.
Sediment loads: Maximum daily, 17,300 tons May 15; minimum daily, 32 tons Sept. 14.
EXTREMES, period of record.--Water temperatures: Maximum, 29°C July 15, 16, 1969, July 1, 11, 28, 30, 1970; minimum, freezing point on many days during winter period.
Sediment concentrations: Maximum daily, 2,850 mg/l Aug. 7, 1968; minimum daily, 19 mg/l Mar. 9, 1970.
Sediment loads: Maximum daily, 247,000 tons Apr. 9, 1969; minimum daily, 14 tons Jan. 13, 14, 1968.
REMARKS.--Flow affected by ice during winter period.

TEMPERATURE (°C) OF WATER, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970
(ONCE-DAILY MEASUREMENT, BETWEEN 0700 AND 1200)

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	16.0	6.0	3.0	--	--	--	2.0	12.0	20.0	28.0	27.0	20.0
2	16.0	6.0	2.0	--	--	--	2.0	13.0	21.0	29.0	26.0	23.0
3	16.0	5.0	0.0	--	--	--	2.0	15.0	21.0	25.0	26.0	25.0
4	18.0	6.0	0.0	--	--	--	4.0	16.0	22.0	25.0	27.0	24.0
5	18.0	6.0	0.0	--	--	0.0	5.0	16.0	24.0	26.0	25.0	25.0
6	13.0	6.0	1.0	--	--	--	4.0	16.0	24.0	24.0	25.0	28.0
7	13.0	6.0	1.0	--	0.0	--	8.0	16.0	23.0	26.0	23.0	25.0
8	10.0	8.0	0.0	--	--	--	6.5	19.0	27.0	26.0	22.0	25.0
9	13.0	9.0	0.0	--	--	--	8.0	19.0	26.0	27.0	23.0	19.0
10	12.0	9.0	0.0	0.0	--	1.0	7.0	19.0	26.0	27.0	25.0	20.0
11	13.0	8.0	0.0	--	--	--	7.0	16.0	23.0	29.0	27.0	20.0
12	9.0	7.0	0.0	--	--	--	7.0	16.0	23.0	28.0	26.0	17.0
13	7.0	2.0	1.0	--	--	--	6.0	15.0	24.0	26.0	28.0	15.0
14	6.0	0.0	0.0	--	0.0	--	7.0	14.0	24.0	27.0	28.0	13.0
15	8.0	2.0	0.0	0.0	--	--	8.0	13.0	25.0	27.0	27.0	14.0
16	7.0	2.0	0.0	--	--	--	9.0	15.0	26.0	29.0	23.0	15.0
17	5.0	2.0	0.0	--	--	--	8.0	17.0	25.0	27.0	25.0	15.0
18	6.0	0.0	0.0	--	--	--	8.0	20.0	22.0	28.0	24.0	17.0
19	9.0	0.0	0.0	--	--	--	7.0	20.0	22.0	24.0	25.0	18.0
20	9.0	1.0	0.0	--	--	--	6.0	22.0	19.0	25.0	22.0	20.0
21	8.0	2.0	0.0	--	1.0	--	8.0	22.0	21.0	25.0	23.0	21.0
22	7.0	1.0	0.0	--	--	1.0	6.0	19.0	23.0	26.0	23.0	20.0
23	8.0	3.0	0.0	--	--	2.0	8.0	19.0	22.0	25.0	24.0	17.0
24	6.0	3.0	--	--	--	2.0	10.0	22.0	23.0	25.0	25.0	16.0
25	7.0	3.0	--	0.0	1.0	2.0	11.0	20.0	24.0	28.0	24.0	14.0
26	6.0	1.0	--	--	--	1.0	14.0	19.0	23.0	28.0	26.0	15.0
27	4.0	1.0	--	--	--	1.0	15.0	16.0	24.0	27.0	26.0	15.0
28	6.0	2.0	--	--	--	3.0	17.0	20.0	25.0	29.0	23.0	16.0
29	6.0	2.0	--	0.0	--	2.0	18.0	20.0	27.0	27.0	24.0	15.0
30	5.0	3.0	--	--	--	2.0	16.0	20.0	27.0	29.0	22.0	18.0
31	6.0	--	0.0	--	--	2.0	--	21.0	--	27.0	22.0	--
AVG	9.5	3.7	0.3	--	--	--	8.2	17.6	23.5	26.7	24.7	18.8

PARTICLE SIZE OF BED MATERIAL, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970
(METHOD OF ANALYSIS: H, HYDROMETER; O, OPTICAL ANALYZER; S, SIEVE; V, VISUAL ACCUMULATION TUBE)

DATE	TIME	WATER TEMPERATURE (C)	NUMBER OF SAMPLING POINTS	DISCHARGE (CFS)	PARTICLE SIZE PERCENT FINER THAN THE SIZE (IN MILLIMETERS) INDICATED .062	.125	.250	.500	1.00	2.00	4.00	8.00	16.0	32.0	64.0	METHOD OF ANALYSIS
OCT 7, 1969	1115	15	3	366	--	--	--	--	52	59	64	76	--	--	--	S
APR 8, 1970	1330	6.5	4	6610	14	35	75	96	98	99	100	--	--	--	--	S
JUN 18.....	1130	22	4	5960	2	8	67	91	95	98	100	--	--	--	--	V

05325000 MINNESOTA RIVER AT MANKATO, MINN.--Continued

SUSPENDED-SEDIMENT DISCHARGE, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

	OCTOBER			NOVEMBER			DECEMBER		
DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
1	395	76	81	511	57	79	520	58	81
2	395	82	87	529	55	79	520	44	62
3	374	96	97	547	60	89	510	40	55
4	353	102	97	556	63	95	505	43	59
5	360	112	109	575	100	155	500	58	78
6	374	85	86	603	87	142	490	38	51
7	381	77	79	613	78	129	480	44	57
8	388	75	79	622	79	133	475	56	72
9	381	73	75	622	86	144	465	56	71
10	381	75	77	622	85	143	450	51	62
11	395	77	82	603	83	135	445	36	43
12	427	73	84	594	57	91	460	46	57
13	467	65	82	584	45	71	480	63	82
14	443	72	86	484	45	59	490	52	69
15	435	62	73	435	40	47	485	45	59
16	475	67	86	484	53	69	480	48	62
17	467	67	84	538	44	64	485	62	80
18	459	77	95	493	41	55	485	60	79
19	467	77	97	309	55	46	460	45	56
20	464	67	88	395	63	67	425	53	61
21	493	100	133	475	61	78	41[illegible]	48	53
22	464	86	112	493	80	106	405	49	54
23	459	57	71	493	78	104	415	51	57
24	443	50	60	502	48	65	420	53	60
25	443	54	65	500	60	81	425	53	61
26	451	55	67	500	60	81	425	53	61
27	435	61	72	500	43	58	425	53	61
28	411	75	83	505	42	57	425	56	64
29	411	57	63	515	62	86	425	57	65
30	427	52	60	520	76	107	430	56	65
31	493	57	76	--	--	--	430	57	66
TOTAL	13251	--	2586	15722	--	2715	14240	--	1961

	JANUARY			FEBRUARY			MARCH		
DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
1	435	57	67	565	46	70	500	82	111
2	440	56	67	565	48	73	500	82	111
3	450	55	67	565	49	75	500	82	111
4	450	53	64	565	50	76	555	85	127
5	455	50	61	565	52	79	555	81	121
6	455	46	57	560	53	80	555	58	87
7	455	42	52	560	52	79	565	40	61
8	455	42	52	560	50	76	595	30	46
9	455	40	49	555	50	75	650	19	33
10	460	40	50	550	51	76	770	20	42
11	465	40	50	545	52	77	970	22	58
12	470	40	51	540	54	79	1080	22	64
13	475	40	51	540	56	82	1090	24	71
14	480	40	52	540	56	82	1080	26	76
15	485	39	51	540	56	82	1060	33	94
16	490	39	52	535	53	77	1030	38	106
17	490	38	50	535	52	75	1010	36	98
18	490	37	49	530	51	73	1000	37	100
19	490	37	49	530	50	72	1010	36	98
20	490	40	53	530	49	70	1040	35	98
21	490	40	53	530	47	67	1100	36	107
22	490	38	50	530	56	80	1150	35	109
23	490	36	48	530	59	84	1200	28	91
24	495	36	48	525	59	84	1270	37	127
25	515	32	44	520	79	111	1340	50	181
26	535	30	43	500	85	115	1500	55	223
27	550	29	43	500	82	111	1580	42	179
28	560	31	47	500	82	111	1680	49	222
29	565	45	69	--	--	--	1750	51	241
30	565	50	76	--	--	--	1880	45	228
31	565	48	73	--	--	--	2020	50	273
TOTAL	15155	--	1688	15110	--	2291	32585	--	3696

05325000 MINNESOTA RIVER AT MANKATO, MINN.--Continued

SUSPENDED-SEDIMENT DISCHARGE, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

	APRIL			MAY			JUNE		
DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
1	2200	74	440	7930	290	6210	4620	290	3620
2	2420	97	634	7730	260	5430	4780	320	4130
3	2660	92	661	7580	208	4260	4760	308	3960
4	2800	85	643	7400	212	4240	4500	282	3430
5	3090	120	1000	7140	210	4050	4190	263	2980
6	3730	165	1660	6800	191	3510	3910	257	2710
7	4800	282	3650	6340	210	3590	3710	250	2500
8	6700	583	10500	6050	182	2970	3580	243	2350
9	7860	580	12300	5680	201	3080	3440	257	2390
10	7910	452	9650	5270	206	2930	3270	271	2390
11	7500	381	7720	4850	203	2660	3130	251	2120
12	6930	350	6550	4510	233	2840	3050	243	2000
13	6540	295	5210	4250	223	2560	3030	238	1950
14	6180	227	3790	4490	225	2730	3170	231	1980
15	6010	225	3650	6040	1030	17300	3310	279	2490
16	6140	254	4210	7840	809	17100	3570	300	2890
17	6250	257	4340	7680	462	9580	4550	491	6030
18	6210	249	4170	6800	335	6150	6100	555	9140
19	6330	256	4380	6140	314	5210	6840	552	10200
20	6990	242	4570	5600	311	4700	7190	432	8390
21	7610	248	5100	5160	248	3460	7310	340	6710
22	8000	263	5680	4810	230	2990	7500	325	6580
23	8280	260	6260	4400	192	2280	7420	315	6310
24	8500	312	7160	4070	182	2000	7190	297	5770
25	8660	333	7790	3950	197	2100	6790	290	5320
26	8590	338	7840	3800	165	1690	6330	287	4910
27	8430	306	6960	3910	185	1950	5770	293	4560
28	8390	200	4530	4070	218	2400	5210	283	3980
29	8250	176	3920	4380	233	2760	4710	312	3970
30	8080	273	5960	4630	328	4100	4240	287	3290
31	--	--	--	4540	300	3680	--	--	--
TOTAL	192040	--	150928	173840	--	140510	147170	--	129050

	JULY			AUGUST			SEPTEMBER		
DAY	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	SEDIMENT DISCHARGE (TONS/DAY)
1	3950	257	2740	1200	90	292	349	58	55
2	3790	269	2750	1110	82	246	504	52	71
3	3510	289	2740	993	82	220	762	42	86
4	3250	314	2760	905	83	203	685	48	89
5	3010	321	2610	828	85	190	718	50	97
6	2780	280	2100	762	97	200	718	42	81
7	2550	234	1610	740	96	192	674	48	87
8	2370	213	1360	784	90	191	587	55	87
9	2130	162	932	762	82	169	531	48	69
10	1850	132	659	795	80	172	504	48	65
11	1620	97	424	784	69	146	431	45	52
12	1540	90	374	872	50	118	401	48	52
13	1750	260	1230	982	48	127	368	34	34
14	2130	300	1730	960	64	166	349	34	32
15	2880	315	2450	905	77	188	401	35	38
16	2950	315	2510	828	60	134	401	35	38
17	2830	282	2150	729	43	85	495	28	37
18	2420	233	1520	674	43	78	504	33	45
19	2060	240	1330	663	55	98	522	46	65
20	1730	207	967	631	62	106	513	50	69
21	1520	180	739	558	40	60	513	55	76
22	1390	156	585	522	40	56	495	58	78
23	1290	137	477	478	42	54	495	54	72
24	1190	112	360	439	37	44	546	60	88
25	1130	81	247	408	40	44	612	49	81
26	1060	60	172	388	39	41	704	53	101
27	1130	104	317	368	45	45	833	75	169
28	1050	75	213	349	57	54	894	93	224
29	1060	54	155	337	52	47	875	87	206
30	1170	52	164	331	47	42	812	75	164
31	1240	85	285	320	50	43	--	--	--
TOTAL	64330	--	38660	21405	--	3851	17196	--	2508

TOTAL DISCHARGE FOR YEAR (CFS-DAYS) 722044
TOTAL SUSPENDED-SEDIMENT DISCHARGE FOR YEAR (TONS) 480444

05331000 MISSISSIPPI RIVER AT ST. PAUL, MINN.

LOCATION.--Lat 44°56'40", long 93°05'20", in SE¼NE¼ sec.6, T.28 N., R.22 W., Ramsey County, temperature recorder at gaging station on left bank in St. Paul, 300 ft upstream from Robert Street Bridge, 6 miles downstream from Minnesota River, and at mile 839.3 upstream from Ohio River.
DRAINAGE AREA.--36,800 sq mi, approximately.
PERIOD OF RECORD.--Water temperatures: October 1956 to current year.

TEMPERATURE (°C) OF WATER, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970
(WATER-STAGE RECORDER WITH TEMPERATURE ATTACHMENT)

DAY	OCT		NOV		DEC		JAN		FEB		MAR	
	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1	18.0	17.0	9.5	8.0	2.0	0.0	4.5	4.5	6.5	4.5	7.0	5.5
2	18.0	17.0	9.5	8.0	3.0	0.0	4.5	3.5	6.5	4.0	7.0	5.5
3	18.5	17.0	9.5	7.0	1.5	0.0	4.5	3.5	6.0	4.5	6.5	4.0
4	18.5	17.0	9.0	7.0	1.5	0.0	4.5	3.5	5.5	4.0	7.0	6.0
5	18.5	18.0	9.0	7.0	2.0	0.0	4.5	3.5	5.0	4.5	7.0	5.5
6	18.5	17.0	8.5	6.5	2.0	0.0	5.5	4.0	5.5	4.5	6.5	5.0
7	17.0	16.5	8.5	7.0	3.0	0.0	5.5	4.5	5.5	5.0	6.0	5.0
8	16.5	16.5	8.5	7.0	3.0	0.5	5.5	4.0	6.0	5.0	5.5	5.0
9	16.5	16.0	8.5	7.0	3.0	0.5	5.0	3.5	5.5	5.5	6.0	4.5
10	16.5	15.5	9.0	8.0	4.0	0.5	4.5	3.0	6.5	5.5	6.0	5.0
11	16.5	15.0	9.0	8.0	4.0	0.0	4.5	3.0	6.5	5.0	6.0	5.5
12	15.5	14.5	8.5	7.0	3.5	0.5	5.0	3.0	6.5	5.0	5.5	4.5
13	15.5	13.5	8.5	6.5	4.0	0.0	5.0	3.5	6.5	4.5	6.0	5.0
14	15.0	12.0	8.5	6.0	3.0	0.0	5.0	3.0	6.0	5.5	6.5	5.0
15	15.0	11.5	8.0	6.0	4.0	0.5	5.0	2.0	6.0	4.5	6.0	4.5
16	14.5	11.0	7.0	4.5	4.0	1.0	5.0	3.0	6.0	4.0	5.5	4.5
17	14.0	10.5	7.0	4.5	4.0	1.0	5.0	4.0	6.0	5.0	5.5	4.5
18	13.0	10.5	6.5	4.5	4.0	1.0	5.5	4.5	7.0	5.0	6.0	5.0
19	13.0	10.5	6.5	4.0	4.0	1.0	6.0	5.0	6.5	5.0	6.5	5.5
20	13.0	10.5	6.0	2.0	4.0	1.5	6.0	5.5	6.0	5.0	6.0	5.0
21	12.0	11.0	5.5	2.0	4.0	2.0	6.0	5.0	6.0	5.0	6.5	5.5
22	12.0	10.5	5.0	2.0	4.0	1.0	6.0	4.5	6.5	5.5	6.0	5.5
23	12.0	10.0	5.0	3.0	4.5	1.0	6.0	4.5	6.5	6.0	6.5	5.5
24	11.5	9.5	5.0	3.0	4.0	1.5	6.0	4.5	7.0	5.5	6.5	5.5
25	11.5	9.5	5.5	3.5	4.0	2.0	6.0	4.0	7.0	5.5	6.5	5.5
26	11.5	9.5	5.0	1.5	4.0	2.0	6.5	5.0	7.0	5.5	6.5	5.5
27	11.5	9.0	4.0	1.5	4.0	3.0	6.5	4.5	6.5	5.5	6.5	5.5
28	10.5	8.0	4.0	1.0	4.0	1.5	6.5	5.5	6.5	5.5	6.0	5.0
29	10.0	8.0	3.5	0.0	4.5	2.0	6.5	4.5	--	--	5.5	4.5
30	10.0	8.0	3.0	0.5	4.5	2.0	6.0	4.5	--	--	5.5	5.0
31	9.5	7.0	--	--	4.5	3.0	5.5	4.0	--	--	5.5	5.0
AVG	14.5	12.5	7.0	5.0	3.5	1.0	5.5	4.0	6.5	5.0	6.5	5.0

05331000 MISSISSIPPI RIVER AT ST. PAUL, MINN.--Continued

EXTREMES, current year.--Water temperatures: Maximum recorded, 29.5°C July 14; minimum, freezing point on several days during winter period.
EXTREMES, period of record.--Water temperatures: Maximum, 31°C July 24-28, 1964; minimum, freezing point on many days during winter period.
REMARKS.--Recorder stopped July 27 to Aug. 19, Aug. 29 to Sept. 7.

TEMPERATURE (°C) OF WATER, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970
(WATER-STAGE RECORDER WITH TEMPERATURE ATTACHMENT)

DAY	APR		MAY		JUN		JUL		AUG		SEP	
	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1	5.5	5.5	13.5	12.0	19.0	17.0	28.0	25.5	--	--	--	--
2	5.5	5.5	13.5	13.0	20.0	18.0	28.5	26.0	--	--	--	--
3	6.5	5.5	13.0	13.0	20.0	18.0	28.5	25.5	--	--	--	--
4	6.0	5.5	13.0	13.0	21.0	18.0	26.0	25.0	--	--	--	--
5	6.0	5.5	13.0	13.0	21.5	19.0	25.0	24.0	--	--	--	--
6	6.5	5.5	14.0	13.5	22.0	20.0	25.5	24.0	--	--	--	--
7	6.5	6.0	15.0	14.0	24.0	20.0	26.5	24.5	--	--	--	--
8	8.0	6.5	16.5	14.5	25.0	20.5	26.5	24.5	--	--	26.5	25.5
9	7.0	7.0	16.5	15.5	24.5	21.0	27.0	25.0	--	--	26.5	25.5
10	6.5	6.5	16.0	14.5	24.5	22.0	28.5	25.5	--	--	25.5	24.0
11	6.5	6.5	15.0	14.5	24.5	22.0	29.0	26.0	--	--	24.0	23.5
12	--	--	14.5	14.0	24.5	22.0	29.0	27.0	--	--	24.0	24.0
13	5.5	5.5	15.0	14.0	24.0	22.0	29.0	27.0	--	--	23.0	21.0
14	5.5	5.5	14.5	13.5	24.0	22.0	29.5	27.0	--	--	23.0	20.5
15	6.0	5.5	14.0	13.5	23.5	22.0	29.0	27.0	--	--	21.5	19.5
16	6.5	6.0	13.5	13.5	24.5	22.0	28.0	26.5	--	--	20.5	18.5
17	6.5	6.5	14.5	13.0	25.0	23.5	28.5	26.5	--	--	20.0	19.0
18	6.5	6.5	16.5	13.5	25.0	23.5	29.0	27.0	--	--	20.0	19.0
19	6.5	6.5	16.0	14.5	24.0	22.0	28.5	26.0	--	--	20.0	19.5
20	6.5	6.5	19.0	15.5	23.0	22.0	26.0	25.5	28.0	23.0	20.0	19.0
21	6.5	6.5	19.5	16.0	22.0	21.0	25.5	25.0	26.5	25.5	20.0	19.5
22	6.5	6.5	19.5	16.5	23.5	21.0	26.0	25.0	26.5	25.5	20.0	19.5
23	6.5	6.5	18.5	16.5	23.5	21.5	26.0	24.5	27.0	25.5	19.5	19.5
24	7.0	6.5	19.0	16.5	24.0	22.0	26.0	24.5	27.0	26.0	19.5	19.0
25	9.0	7.0	19.0	17.0	24.0	23.0	27.0	25.0	28.0	26.0	19.5	19.0
26	10.0	9.0	18.5	16.5	23.5	22.0	26.5	25.5	28.0	26.5	19.0	18.5
27	10.0	9.0	18.0	16.0	23.0	21.5	--	--	28.5	26.5	19.0	18.5
28	10.0	9.0	18.0	16.0	24.0	22.0	--	--	26.5	25.5	18.5	18.5
29	11.5	10.0	18.5	16.0	26.0	22.0	--	--	--	--	18.5	18.0
30	12.0	11.5	18.5	16.5	27.0	24.0	--	--	--	--	18.0	17.0
31	--	--	19.0	17.0	--	--	--	--	--	--	--	--
AVG	7.5	7.0	16.0	14.5	23.5	21.5	27.5	25.5	--	--	21.0	20.0

05344980 MISSISSIPPI RIVER AT LOCK AND DAM 3, NEAR RED WING, MINN.

LOCATION.--Lat 44°36'36", long 92°36'36", in SW¼NW¼ sec.10, T.113 N., R.15 W., Goodhue County, on right bank on downstream side of dam, 5 miles northwest of Red Wing, and at mile 796.7 upstream from Ohio River.
DRAINAGE AREA.--46,600 sq mi, approximately.
PERIOD OF RECORD.--Chemical analyses: July 1969 to current year.
Water temperatures: August 1969 to current year.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	DIS-CHARGE (CFS)	SULFATE (SO4) (MG/L)	CHLO-RIDE (CL) (MG/L)	HARD-NESS (CA,MG) (MG/L)	ALKA-LINITY AS CACO3 (MG/L)	PH (UNITS)	COLOR (PLAT-INUM-COBALT UNITS)
OCT.							
01...	6630	32	16	188	168	8.0	25
08...	7800	23	12	168	155	7.9	20
16...	10300	22	12	164	152	8.0	20
22...	9400	23	12	166	151	8.3	20
29...	9200	22	12	162	153	8.0	25
30...	9200	--	--	--	--	--	--
NOV.							
25...	8000	--	--	--	--	7.8	--
DEC.							
10...	8180	26	12	176	161	7.9	20
17...	7850	29	20	174	156	7.7	20
22...	8000	--	--	--	--	--	--
JAN.							
16...	8600	32	15	--	175	7.2	20
26...	8580	--	--	--	--	--	--
28...	8060	31	15	192	178	7.1	20
FEB.							
05...	7600	29	19	190	184	7.6	20
18...	8160	26	12	184	182	7.5	15
26...	7800	29	13	188	176	7.7	15
27...	7020	--	--	--	--	--	--
MAR.							
04...	13400	31	18	196	180	7.6	15
11...	9500	28	23	184	165	7.5	15
18...	8780	31	13	188	171	7.6	15
25...	16000	33	21	192	171	7.7	15
APR.							
02...	13200	36	13	202	172	7.9	15
06...	14800	--	--	--	--	--	--
22...	33000	56	11	188	136	8.0	35
29...	51300	64	8.5	194	130	7.9	45
MAY							
06...	47400	68	8.8	192	123	7.9	50
08...	43100	--	--	--	--	--	--
13...	31000	60	8.0	180	127	7.9	60
20...	26400	62	10	208	144	8.1	45
27...	23600	41	10	168	128	8.0	45
JUNE							
10...	20700	45	9.0	182	137	8.1	50
17...	19000	66	10	198	154	8.0	50
17...	19000	--	--	--	--	--	--
24...	24700	65	9.6	232	152	8.1	50
JULY							
01...	19300	79	9.8	240	154	8.0	45
08...	11800	83	11	250	170	8.2	35
15...	11500	64	11	212	161	8.0	35
23...	8150	60	13	202	153	8.4	30
24...	15000	--	--	--	--	--	--
29...	8150	51	15	194	148	7.9	35
AUG.							
07...	5280	44	13	176	142	8.5	30
31...	7050	--	--	--	--	--	--

05344980 MISSISSIPPI RIVER AT LOCK AND DAM 3, NEAR RED WING, MINN.--Continued

EXTREMES, current year.--Water temperatures: Maximum, 28°C July 2, 14, 17, 30; minimum, freezing point on many days during winter period.
EXTREMES, period of record.--Water temperatures: Maximum, 28°C July 2, 14, 17, 30, 1970; minimum, freezing point on many days during winter period.
REMARKS.--Some analyses furnished by Metropolitan Wastewater Treatment Plant and Water Quality Office, Environmental Protection Agency.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	TURBIDITY (JTU)	TEMPERATURE (DEG C)	DISSOLVED OXYGEN (MG/L)	BIOCHEMICAL OXYGEN DEMAND (MG/L)	COLIFORM (COLONIES PER 100 ML)	COLIFORM (MPN)
OCT.						
01...	15	17.0	8.4	4.2	4900	--
08...	15	15.0	8.2	2.8	790	--
16...	25	10.0	8.8	2.7	13000	--
22...	30	9.0	9.0	3.4	--	--
29...	15	7.0	9.9	2.6	23000	--
30...	--	5.0	--	--	--	--
NOV.						
25...	--	2.0	--	--	--	--
DEC.						
10...	8.0	.0	12.0	3.8	--	7900
17...	9.0	.0	10.6	3.2	--	13000
22...	--	1.0	--	2.7	--	--
JAN.						
16...	4.0	.0	8.2	2.6	--	6400
26...	--	1.0	--	--	--	--
28...	5.0	1.0	7.9	2.8	--	35000
FEB.						
05...	4.0	.0	7.5	2.6	--	4900
18...	4.0	.0	7.5	2.5	--	7900
26...	5.0	1.0	7.7	2.6	--	11000
27...	--	.0	--	--	--	--
MAR.						
04...	6.0	.0	8.4	3.2	--	7900
11...	6.0	1.0	7.4	2.6	--	3300
18...	5.0	1.0	9.6	2.8	--	930
25...	5.0	4.0	10.0	2.8	--	3500
APR.						
02...	8.0	3.0	12.7	3.9	--	3100
06...	--	4.0	--	--	--	--
22...	30	5.0	10.1	3.0	--	33000
29...	20	14.0	9.0	3.1	--	3100
MAY						
06...	50	13.0	9.3	3.4	--	780
08...	--	15.0	--	--	--	--
13...	60	14.0	8.2	2.6	--	3300
20...	90	17.0	8.5	3.3	--	33000
27...	25	15.0	8.3	2.8	--	1700
JUNE						
10...	45	25.0	6.6	2.8	--	1300
17...	55	24.0	6.5	2.9	--	2300
17...	--	24.0	--	--	--	--
24...	85	23.0	6.8	3.0	--	2400
JULY						
01...	45	26.0	7.0	2.7	--	450
08...	25	24.0	7.8	3.4	--	920
15...	30	26.0	6.8	3.4	--	200
23...	30	24.0	9.2	4.8	--	330
24...	--	24.0	--	--	--	--
29...	35	26.0	7.0	4.2	--	330
AUG.						
07...	30	25.0	8.8	4.6	--	130
31...	--	22.0	--	--	--	--

05344980 MISSISSIPPI RIVER AT LOCK AND DAM 3, NEAR RED WING, MINN.--Continued

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	DIS-CHARGE (CFS)	TEMP-ERATURE (DEG C)	ORGANIC NITRO-GEN (N) (MG/L)	AMMONIA NITRO-GEN (N) (MG/L)	NITRATE (N) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	DIS-SOL-VED-PHOS-PHORUS (P) (MG/L)
OCT.							
01...	6630	17.0	--	--	--	--	--
07-10	--	--	--	--	--	--	--
08...	7800	15.0	--	--	--	--	--
16...	10300	10.0	--	--	--	--	--
22...	9400	9.0	--	--	--	--	--
29...	9200	7.0	--	--	--	--	--
30...	9200	5.0	.68	.60	.30	.30	.28
NOV.							
04-11	--	--	--	--	--	--	--
25...	8000	2.0	.18	.46	.20	.88	.44
DEC.							
02-09	--	--	--	--	--	--	--
10...	8180	.0	--	--	--	--	--
17...	7850	.0	--	--	--	--	--
22...	8000	1.0	.20	.40	.50	.33	.31
JAN.							
06-13	--	--	--	--	--	--	--
16...	8600	.0	--	--	--	--	--
26...	8580	1.0	.42	.84	.50	.36	.29
28...	8060	1.0	--	--	--	--	--
FEB.							
03-10	--	--	--	--	--	--	--
05...	7600	.0	--	--	--	--	--
18...	8160	.0	--	--	--	--	--
26...	7800	1.0	--	--	--	--	--
27...	7020	.0	.56	.88	.50	.38	.37
MAR.							
03-10	--	--	--	--	--	--	--
04...	13400	.0	--	--	--	--	--
11...	9500	1.0	--	--	--	--	--
18...	8780	1.0	--	--	--	--	--
25...	16000	4.0	--	--	--	--	--
APR.							
02...	13200	3.0	--	--	--	--	--
06...	14800	4.0	.40	.30	.78	.32	.25
07-14	--	--	--	--	--	--	--
22...	33000	5.0	--	--	--	--	--
29...	51300	14.0	--	--	--	--	--
MAY							
05-07	--	--	--	--	--	--	--
06...	47400	13.0	--	--	--	--	--
08...	43100	15.0	.96	.14	.66	.33	.06
13...	31000	14.0	--	--	--	--	--
20...	26400	17.0	--	--	--	--	--
27...	23600	15.0	--	--	--	--	--
JUNE							
10...	20700	25.0	--	--	--	--	--
17...	19000	24.0	--	--	--	--	--
17...	19000	24.0	1.1	.45	.04	.24	.16
24...	24700	23.0	--	--	--	--	--
JULY							
01...	19300	26.0	--	--	--	--	--
08...	11800	24.0	--	--	--	--	--
15...	11500	26.0	--	--	--	--	--
23...	8150	24.0	--	--	--	--	--
24...	15000	24.0	1.2	.11	.16	.32	.20
29...	8150	26.0	--	--	--	--	--
AUG.							
01-31	--	--	--	--	--	--	--
SEPT.							
01-04	--	--	--	--	--	--	--
AUG.							
04-08	--	--	--	--	--	--	--
07...	5280	25.0	--	--	--	--	--
31...	7050	22.0	1.1	1.0	.19	.42	.35

05344980 MISSISSIPPI RIVER AT LOCK AND DAM 3, NEAR RED WING, MINN.--Continued

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	NITRATE (NO3) (MG/L)	METHYLENE BLUE ACTIVE SUBSTANCE (MG/L)	SAMPLE SIZE (GALS)	TOTAL CARBON EXTRACTABLES (UG/L)	CARBON ALCOHOL EXTRACTABLES (UG/L)	CARBON CHLOROFORM EXTRACTABLES (UG/L)
OCT.						
01...	--	--	--	--	--	--
07-10	--	--	2400	287	243	44
08...	--	--	--	--	--	--
16...	--	--	--	--	--	--
22...	--	--	--	--	--	--
29...	--	--	--	--	--	--
30...	1.5	.03	--	--	--	--
NOV.						
04-11	--	--	3867	303	228	75
25...	1.1	.00	--	--	--	--
DEC.						
02-09	--	--	3702	223	149	74
10...	--	--	--	--	--	--
17...	--	--	--	--	--	--
22...	2.2	.00	--	--	--	--
JAN.						
06-13	--	--	4487	242	182	60
16...	--	--	--	--	--	--
26...	2.1	.02	--	--	--	--
28...	--	--	--	--	--	--
FEB.						
03-10	--	--	4717	305	182	123
05...	--	--	--	--	--	--
18...	--	--	--	--	--	--
26...	--	--	--	--	--	--
27...	2.2	.12	--	--	--	--
MAR.						
03-10	--	--	3778	--	--	--
04...	--	--	--	--	--	--
11...	--	--	--	--	--	--
18...	--	--	--	--	--	--
25...	--	--	--	--	--	--
APR.						
02...	--	--	--	--	--	--
06...	3.4	.C9	--	--	--	--
07-14	--	--	2495	653	299	354
22...	--	--	--	--	--	--
29...	--	--	--	--	--	--
MAY						
05-07	--	--	1266	595	396	199
06...	--	--	--	--	--	--
08...	2.9	.02	--	--	--	--
13...	--	--	--	--	--	--
20...	--	--	--	--	--	--
27...	--	--	--	--	--	--
JUNE						
10...	--	--	--	--	--	--
17...	--	--	--	--	--	--
17...	.2	.C6	--	--	--	--
24...	--	--	--	--	--	--
JULY						
01...	--	--	--	--	--	--
08...	--	--	--	--	--	--
15...	--	--	--	--	--	--
23...	--	--	--	--	--	--
24...	.7	.C4	--	--	--	--
29...	--	--	--	--	--	--
AUG.						
01-31	--	--	1344	643	431	212
SEPT.						
01-04	--	--	1344	643	431	212
AUG.						
04-08	--	--	946	876	569	307
07...	--	--	--	--	--	--
31...	.8	.C4	--	--	--	--

05344980 MISSISSIPPI RIVER AT LOCK AND DAM 3, NEAR RED WING, MINN.--Continued

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	TOTAL RESIDUE (MG/L)	TOTAL FILTRABLE RESIDUE (MG/L)	TOTAL NONFILTRABLE RESIDUE (MG/L)	TOTAL ALPHA (PC/L)	TOTAL ALPHA (COUNTING ERROR)	DISSOLVED ALPHA (PC/L)	DISSOLVED ALPHA (COUNTING ERROR)	SUSPENDED ALPHA (PC/L)
DEC. 11...	--	344	37	.0	1.0	.0	1.0	.0
JUNE 26...	352	308	44	1.0	1.0	1.0	1.0	.0

TEMPERATURE (°C) OF WATER, OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT		NOV		DEC		JAN		FEB		MAR	
	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1	17.0	16.5	7.5	7.5	2.0	2.0	0.5	0.5	1.0	0.5	1.5	1.0
2	18.0	17.0	7.5	7.5	2.0	2.0	0.5	0.5	0.5	0.0	1.5	1.0
3	18.0	17.5	7.5	7.5	2.0	1.5	0.5	0.5	0.0	0.0	1.5	1.0
4	18.5	18.0	7.5	7.0	1.5	1.5	0.5	0.0	0.0	0.0	1.5	1.0
5	19.0	18.5	7.5	7.5	1.5	1.5	0.0	0.0	0.0	0.0	1.5	1.0
6	18.5	17.5	8.0	7.5	1.5	1.5	0.0	0.0	0.5	0.0	1.5	1.0
7	18.0	17.0	8.5	8.0	1.5	1.5	0.0	0.0	0.5	0.5	2.0	1.5
8	17.0	16.0	8.5	8.5	1.5	1.0	0.0	0.0	0.5	0.5	2.0	1.5
9	16.0	15.5	8.5	8.5	1.0	1.0	0.0	0.0	0.5	0.5	1.5	1.5
10	15.5	15.0	8.5	8.5	1.0	0.5	0.0	0.0	0.5	0.5	2.0	1.5
11	15.0	14.5	8.5	8.0	1.0	0.5	0.0	0.0	0.5	0.5	2.0	1.5
12	14.5	13.5	8.0	7.5	0.5	0.5	0.0	0.0	0.5	0.5	2.0	1.5
13	13.5	12.5	7.5	5.5	1.0	0.5	0.0	0.0	0.5	0.0	2.0	1.5
14	12.5	11.5	5.5	3.5	0.5	0.5	0.0	0.0	0.0	0.0	2.0	1.5
15	11.5	11.0	3.5	3.0	0.5	0.5	0.5	0.0	0.5	0.0	2.0	1.5
16	11.0	10.5	3.0	3.0	0.5	0.5	0.5	0.0	0.5	0.0	2.5	1.5
17	10.5	10.5	3.5	3.0	1.0	0.5	0.0	0.0	0.5	0.5	2.5	1.5
18	11.0	10.0	4.0	3.0	1.0	1.0	0.0	0.0	0.5	0.0	3.0	2.0
19	10.5	10.0	3.0	1.5	1.0	0.5	0.0	0.0	0.0	0.0	3.0	2.5
20	10.5	10.0	1.5	1.5	0.5	0.5	0.0	0.0	0.0	0.0	3.0	2.5
21	10.5	10.0	1.5	1.5	0.5	0.5	0.0	0.0	0.5	0.0	3.0	2.5
22	10.0	9.5	1.5	1.5	0.5	0.5	0.0	0.0	1.0	0.5	3.5	2.5
23	9.5	9.0	2.0	1.5	0.5	0.5	0.0	0.0	1.0	1.0	3.5	3.0
24	9.0	9.0	2.5	2.0	0.5	0.5	0.5	0.0	1.0	1.0	4.0	3.0
25	9.0	9.0	2.5	2.0	0.5	0.5	0.5	0.5	1.0	0.5	4.0	3.5
26	9.0	8.0	2.5	2.0	0.5	0.5	0.5	0.5	1.0	0.5	3.5	3.0
27	8.0	7.5	2.0	2.0	0.5	0.5	0.5	0.5	1.0	1.0	3.5	2.5
28	7.5	7.5	2.0	2.0	0.5	0.5	0.5	0.5	1.0	1.0	3.0	2.5
29	7.5	7.5	2.0	1.5	0.5	0.5	0.5	0.5	--	--	3.0	2.5
30	7.5	7.0	2.0	1.5	0.5	0.5	0.5	0.5	--	--	3.0	2.5
31	7.5	7.0	--	--	0.5	0.5	0.5	0.5	--	--	3.5	2.5
AVG	12.6	12.0	4.9	4.5	0.9	0.8	0.2	0.2	0.5	0.3	2.5	1.9

05344980 MISSISSIPPI RIVER AT LOCK AND DAM 3, NEAR RED WING, MINN.--Continued

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	SUS-PENDED ALPHA (COUNT-ING ERROR)	TOTAL BETA (PC/L)	TOTAL BETA (COUNT-ING ERROR)	DIS-SOLVED BETA (PC/L)	DIS-SOLVED BETA (COUNT-ING ERROR)	SUS-PENDED BETA (PC/L)	SUS-PENDED BETA (COUNT-ING ERROR)
DEC. 11...	.0	5.0	2.0	4.0	2.0	1.0	1.0
JUNE 26...	.0	10	2.0	10	2.0	.0	1.0

TEMPERATURE (°C) OF WATER, OCTOBER 1969 TO SEPTEMBER 1970

DAY	APR		MAY		JUN		JUL		AUG		SEP	
	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
1	4.0	3.0	14.0	12.5	19.0	18.0	27.0	25.5	27.5	26.5	22.5	22.0
2	3.5	3.0	13.5	12.0	19.5	18.0	28.0	26.5	27.0	26.5	22.5	22.0
3	4.0	3.5	14.5	13.0	20.0	18.5	27.5	25.0	27.0	25.5	23.0	22.5
4	4.0	3.0	15.0	13.5	21.0	19.5	25.0	24.0	26.0	25.0	23.5	22.5
5	4.0	3.5	15.0	14.0	22.0	20.0	25.0	23.5	26.0	25.0	23.5	23.0
6	5.0	3.5	15.0	13.5	23.0	21.0	25.0	24.0	26.0	25.5	23.5	23.0
7	6.5	4.5	15.0	14.0	23.5	21.5	25.5	24.5	25.5	25.0	24.0	23.5
8	7.5	6.5	17.0	14.5	24.0	22.5	25.0	24.5	25.0	24.5	23.5	23.0
9	7.5	6.5	17.0	16.0	23.5	22.5	26.0	24.5	26.0	25.0	23.5	22.5
10	7.5	6.5	16.5	15.5	23.5	22.5	26.5	25.0	26.5	25.0	22.5	21.0
11	7.0	5.5	16.0	15.0	24.5	23.0	27.0	26.0	26.5	25.5	21.0	20.5
12	6.0	5.0	15.0	14.0	24.0	23.5	27.5	26.5	26.5	26.0	21.0	19.5
13	5.0	4.0	15.5	14.0	24.0	23.0	27.5	27.0	26.5	26.0	19.5	18.5
14	6.0	4.0	15.0	14.0	24.0	23.5	28.0	27.0	26.5	26.0	18.5	18.0
15	5.5	5.0	14.0	13.0	24.0	23.0	27.5	26.5	27.0	26.0	18.0	17.0
16	7.5	5.0	13.0	12.5	25.0	23.5	27.0	26.0	26.0	25.5	17.5	17.0
17	7.5	6.5	15.0	12.0	26.0	24.0	28.0	26.0	25.5	25.0	18.0	16.0
18	7.0	6.5	17.0	14.5	25.0	22.5	27.5	26.5	25.5	25.0	18.0	16.5
19	6.5	6.0	18.0	16.0	23.0	22.0	27.0	25.5	25.0	24.5	18.5	17.5
20	6.0	5.5	19.0	17.0	22.5	22.0	25.5	24.5	24.5	24.0	18.5	18.5
21	6.0	5.5	20.0	18.5	22.5	21.5	25.0	24.5	24.0	23.5	19.5	18.5
22	6.0	5.5	19.5	18.5	24.0	22.0	25.0	24.5	24.0	23.5	19.5	19.0
23	7.5	5.5	19.0	18.0	24.0	23.0	25.0	24.5	24.0	23.0	19.0	19.0
24	8.5	6.5	19.0	18.0	24.0	23.0	25.0	24.5	24.5	23.0	19.0	18.5
25	9.5	7.5	19.0	17.5	23.5	22.5	25.5	24.5	24.0	23.5	18.5	17.5
26	11.0	8.5	17.5	16.0	22.5	22.0	26.0	25.0	24.5	24.0	17.5	17.0
27	12.5	10.0	17.0	15.5	23.5	22.0	26.5	25.0	25.5	24.0	17.0	16.5
28	13.5	12.0	17.0	15.5	24.5	23.0	27.0	26.0	25.0	24.0	17.0	16.5
29	15.0	13.0	18.5	17.0	26.0	24.0	26.5	26.0	24.0	23.0	17.5	16.5
30	15.0	14.0	19.0	18.0	26.5	25.0	28.0	26.0	23.5	23.0	17.5	16.5
31	--	--	19.0	18.5	--	--	27.5	27.0	23.0	22.5	--	--
AVG	7.4	6.2	16.6	15.2	23.4	22.1	26.5	25.4	25.4	24.6	20.1	19.3

05376000 NORTH FORK WHITEWATER RIVER NEAR ELBA, MINN.

LOCATION.--Lat 44°05'30", long 92°03'57", in sec.7, T.107 N., R.10 W., Winona County, at gaging station on left bank, 2.3 miles upstream from Middle Fork, 2.4 miles west of Elba, and 3.5 miles upstream from confluence with South Fork.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	DIS-CHARGE (CFS)	SILICA (SIO2) (MG/L)	DIS-SOLVED ALUM-INUM (AL) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	PO-TAS-SIUM (K) (MG/L)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	ALKA-LINITY AS CACO3 (MG/L)
OCT.												
22...	21	14	144	6	33	70	25	3.6	2.3	321	0	263
22...	21	--	--	--	--	--	--	--	--	--	--	--
DEC.												
03...	19	15	234	11	0	69	25	4.2	1.5	319	0	262
03...	19	--	--	--	--	--	--	--	--	--	--	--
JAN.												
14...	19	16	--	--	--	69	25	4.9	25	320	0	263
FEB.												
10...	18	15	--	--	--	67	26	2.3	26	320	0	262
10...	17	--	--	--	--	--	--	--	--	--	--	--
MAR.												
19...	21	14	--	--	--	65	23	5.0	1.6	314	0	257
MAY												
05...	24	8.1	64	68	20	66	24	5.1	1.8	312	0	256
JUNE												
04...	38	--	--	--	--	--	--	--	--	--	--	--
04...	38	17	161	13	117	80	23	5.2	3.1	256	0	210
JULY												
15...	24	12	--	--	--	67	25	6.0	2.3	301	10	264
15...	24	--	--	--	--	--	--	--	--	--	--	--
AUG.												
12...	23	14	--	27	70	69	26	5.1	1.8	323	0	265
SEPT.												
10...	22	--	--	--	--	--	--	--	--	--	--	--
10...	22	17	--	--	--	62	21	4.4	5.0	281	0	230
AUG.												
12...	23	--	--	--	--	--	--	--	--	--	--	--

05376000 NORTH FORK WHITEWATER RIVER NEAR ELBA, MINN.--Continued

DRAINAGE AREA.--101 sq mi.
PERIOD OF RECORD.--Chemical analyses: August 1967 to current year.

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	SULFATE (SO4) (MG/L)	CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	NITRATE (N) (MG/L)	NITRATE (NO3) (MG/L)	DIS-SOLVED ORTHO PHOS-PHATE (PO4) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	DIS-SOLVED PHOS-PHORUS (P) (MG/L)	DIS-SOLVED BORON (B) (UG/L)	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	DIS-SOLVED SOLIDS (TONS PER AC-FT)
OCT.												
22...	14	4.2	.1	.49	2.2	.28	--	.10	9.5	302	294	.41
22...	--	--	--	--	--	--	--	--	--	--	--	--
DEC.												
03...	15	4.4	.2	1.1	4.7	.18	--	.07	9.5	305	296	.41
03...	--	--	--	--	--	--	--	--	--	--	--	--
JAN.												
14...	6.5	3.4	.2	1.1	4.6	.21	--	.08	2.2	300	288	.41
FEB.												
10...	13	3.2	.1	1.0	4.5	.33	--	.16	10	292	290	.40
10...	--	--	--	--	--	--	--	--	--	--	--	--
MAR.												
19...	11	1.0	.1	1.3	5.8	.58	--	.23	20	297	282	.40
MAY												
05...	15	5.6	.2	.56	2.5	.54	--	.29	.01	290	282	.39
JUNE												
04...	--	--	--	--	--	--	--	--	--	--	--	--
04...	21	7.2	.3	2.7	12	.65	--	.21	16	340	297	.46
JULY												
15...	17	5.8	.4	1.0	4.6	.54	--	.18	33	304	299	.41
15...	--	--	--	--	--	--	--	--	--	--	--	--
AUG.												
12...	16	5.1	.2	1.4	6.3	--	.16	--	10	313	303	.43
SEPT.												
10...	--	--	--	--	--	--	--	--	--	--	--	--
10...	16	5.4	.0	1.8	7.9	--	.34	--	.01	291	277	.40
AUG.												
12...	--	--	--	--	--	--	--	--	--	--	--	--

05376000 NORTH FORK WHITEWATER RIVER NEAR ELBA, MINN.--Continued

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	DIS-SOLVED SOLIDS (TONS PER DAY)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	SPECI-FIC COND-UCTANCE (MICRO-MHOS)	PH (UNITS)	TEMP-ERATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)	DIS-SOLVED OXYGEN (MG/L)	BIO-CHEM-ICAL OXYGEN DEMAND (MG/L)	COLI-FORM (COL-ONIES PER 100 ML)
OCT.												
22...	17.3	277	14	3	.1	499	8.1	7.0	2	--	4.6	--
22...	--	--	--	--	--	500	8.2	--	--	10.5	--	45
DEC.												
03...	16.1	276	14	3	.1	503	7.6	3.0	0	--	.4	--
03...	--	--	--	--	--	490	8.1	--	--	12.3	--	22
JAN.												
14...	15.4	273	10	3	.1	487	7.4	1.0	3	--	.2	--
14...	--	--	--	--	--	490	8.0	--	--	10.5	--	14
FEB.												
10...	14.2	274	12	2	.1	502	8.2	3.0	--	--	.8	--
10...	--	--	--	--	--	450	8.0	--	--	11.7	--	--
MAR.												
19...	17.1	258	0	4	.1	484	8.1	4.0	2	--	.8	--
19...	--	--	--	--	--	490	7.4	4.2	--	12.4	--	20
MAY												
05...	--	--	--	--	--	495	8.0	--	--	13.5	--	--
05...	18.8	262	7	4	.1	488	8.3	13.0	4	--	1.7	--
JUNE												
04...	--	--	--	--	--	545	8.2	14.5	--	8.8	--	--
04...	34.9	295	85	4	.1	525	8.1	--	10	--	1.0	--
JULY												
15...	20.0	270	6	5	.2	501	8.4	19.0	17	--	3.8	--
15...	--	--	--	--	--	505	8.2	--	--	9.8	--	--
AUG.												
12...	19.4	278	13	4	.1	512	8.3	18.0	5	--	.5	--
SEPT.												
10...	--	--	--	--	--	475	7.8	14.5	--	10.5	--	0
10...	17.5	239	9	4	.1	462	7.9	14.5	18	--	1.8	--
AUG.												
12...	--	--	--	--	--	520	7.8	18.0	--	9.8	--	--

DATE	DIS-SOLVED ARSENIC (AS) (UG/L)	DIS-SOLVED CAD-MIUM (CD) (UG/L)	DIS-SOLVED COBALT (CO) (UG/L)	DIS-SOLVED COPPER (CU) (UG/L)	DIS-SOLVED LEAD (PB) (UG/L)	DIS-SOLVED LITHIUM (LI) (UG/L)	DIS-SOLVED MOLY-BDENUM (MO) (UG/L)	DIS-SOLVED NICKEL (NI) (UG/L)	DIS-SOLVED SELE-NIUM (SE) (UG/L)	DIS-SOLVED STRON-TIUM (SR) (UG/L)	DIS-SOLVED VANA-DIUM (V) (UG/L)
JUNE											
04...	0	0	0	15	0	0	3	0	8	85	1

05376000 NORTH FORK WHITEWATER RIVER NEAR ELBA, MINN.--Continued

CHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	ALDRIN (UG/L)	ALDRIN IN BOTTOM DE-POSITS (UG/KG)	DDD (UG/L)	DDD IN BOTTOM DE-POSITS (UG/KG)	DDE (UG/L)	DDE IN BOTTOM DE-POSITS (UG/KG)	DDT (UG/L)	DDT IN BOTTOM DE-POSITS (UG/KG)	DI-ELDRIN (UG/L)	DI-ELDRIN IN BOTTOM DE-POSITS (UG/KG)
OCT. 22...	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
ANALYSIS OF ADDITIONAL SAMPLES										
AUG. 12...	.00	--	.00	--	.00	--	.00	--	.01	--

DATE	ENDRIN (UG/L)	ENDRIN IN BOTTOM DE-POSITS (UG/KG)	HEPTA-CHLOR (UG/L)	LINDANE (UG/L)	LINDANE IN BOTTOM DE-POSITS (UG/KG)	2,4-D (UG/L)	2,4,5-T (UG/L)	SILVEX (UG/L)	CHLOR-DANE (UG/L)	HEPTA-CHLOR EPOXIDE (UG/L)
OCT. 22...	.00	.00	.00	.00	.00	.00	.00	.00	--	--
ANALYSIS OF ADDITIONAL SAMPLES										
AUG. 12...	.00	--	.00	.00	--	.00	.00	.00	.00	.00

RADIOCHEMICAL ANALYSES, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Units of measurement: Uranium, micrograms per liter of water; radium as radium-226, in picocuries per liter of water; gross beta radiation as strontium-90-yttrium-90, in picocuries per liter of water; gross alpha radiation, as micrograms of uranium equivalent per liter of water. A picocurie is one millionth of the amount of radioactivity represented by a micocurie, which is the quantity of radiation represented by one millionth of a gram of radium-226. A picocurie of radium results in 2.22 disintegrations per minute.

	DISSOLVED					SUSPENDED		
DATE	URANIUM µg/ℓ	RADIUM pc/ℓ	GROSS α µg/ℓ	GROSS β pc/ℓ	DISSOLVED SOLIDS mg/ℓ	GROSS α µg/ℓ	GROSS β pc/ℓ	SUSPENDED SOLIDS mg/ℓ
JULY 15...	.8	.07	3.3	3.6	320	1.0	1.2	27

INSTANTANEOUS SUSPENDED SEDIMENT, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	TIME	DISCHARGE (CFS)	CONCEN-TRATION (MG/L)	SUSPENDED SEDIMENT DISCHARGE (TONS/DAY)	DATE	TIME	DISCHARGE (CFS)	CONCEN-TRATION (MG/L)	SUSPENDED SEDIMENT DISCHARGE (TONS/DAY)
OCT 22, 1969	1455	21	60	3.4	MAY 5.....	1120	24	26	1.7
DEC 3.....	1325	20	27	1.5	JUN 4.....	1015	38	140	14
JAN 14, 1970	1200	19	10	.51	JUL 15.....	1230	24	68	4.4
FEB 10.....	1200	19	14	.72	SEP 10.....	1315	22	54	3.2
MAR 19.....	1315	21	15	.85					

DATE	DIS-CHARGE (CFS)	SILICA (SIO2) (MG/L)	DIS-SOLVED ALUM-INUM (AL) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	PO-TAS-SIUM (K) (MG/L)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	ALKA-LINITY AS CACO3 (MG/L)
04014500 - BAPTISM R NR BEAVER BAY MINN (LAT 47 20 15 LONG 091 12 00)												
APR., 1970												
29...	2470	7.1	813	223	45	4.8	1.5	1.2	.5	10	0	8
04024000 - ST. LOUIS RIVER AT SCANLON, MINN. (LAT 46 42 12 LONG 092 25 07)												
OCT., 1969												
06...	1480	9.1	1000	763	68	22	7.6	7.8	1.6	73	0	60
FEB., 1970												
18...	1430	10	631	515	51	20	6.9	8.0	1.1	70	0	57
APR.												
16...	6120	7.4	625	425	110	12	4.9	4.5	1.8	45	0	37
JULY												
14...	1000	6.0	--	288	98	17	6.9	8.6	1.3	69	0	57
05030140 - OTTER TAIL RIVER NORTHWEST OF LUCE, MINN. (LAT 46 40 20 LONG 095 39 51)												
JUNE, 1970												
03...	187	6.5	206	8	0	36	20	5.0	3.2	226	0	185
05030260 - TOAD RIVER NORTH OF PERHAM, MINN. (LAT 46 38 38 LONG 095 30 33)												
JUNE, 1970												
03...	43	13	280	23	8	58	22	6.2	3.7	290	0	238
05030300 - OTTER TAIL RIVER NEAR RICHVILLE, MINN. (LAT 46 30 50 LONG 095 31 03)												
JUNE, 1970												
03...	350	5.6	237	4	15	36	20	5.0	3.7	220	0	180
05030401 - OTTER TAIL RIVER SOUTH OF AMOR, MINN. (LAT 46 21 35 LONG 095 43 57)												
JUNE, 1970												
03...	426	12	139	0	0	28	23	5.2	4.3	212	0	174

DATE	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	DIS-SOLVED SOLIDS (TONS PER AC-FT)	DIS-SOLVED SOLIDS (TONS PER DAY)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	SPECI-FIC COND-UCTANCE (MICRO-MHOS)	PH (UNITS)	TEMP-ERATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)
04014500 - BAPTISM R NR BEAVER BAY MINN (LAT 47 20 15 LONG 091 12 00)											
APR., 1970											
29...	35	.07	353	18	10	12	.1	45	7.3	8.0	40
04024000 - ST. LOUIS RIVER AT SCANLON, MINN. (LAT 46 42 12 LONG 092 25 07)											
OCT., 1969											
06...	123	.24	699	86	26	16	.4	199	7.0	11.0	155
FEB., 1970											
18...	117	.20	571	78	21	18	.4	191	7.8	1.0	50
APR.											
16...	76	.15	1790	51	14	16	.3	118	7.4	3.0	50
JULY											
14...	100	.17	340	70	14	21	.4	175	7.2	27.0	50
05030140 - OTTER TAIL RIVER NORTHWEST OF LUCE, MINN. (LAT 46 40 20 LONG 095 39 51)											
JUNE, 1970											
03...	189	.27	98.5	172	0	6	.2	349	8.2	18.0	7
05030260 - TOAD RIVER NORTH OF PERHAM, MINN. (LAT 46 38 38 LONG 095 30 33)											
JUNE, 1970											
03...	263	.37	32.1	234	0	5	.2	449	8.2	20.0	17
05030300 - OTTER TAIL RIVER NEAR RICHVILLE, MINN. (LAT 46 30 50 LONG 095 31 03)											
JUNE, 1970											
03...	188	.26	180	172	0	6	.2	342	8.2	20.0	5
05030401 - OTTER TAIL RIVER SOUTH OF AMOR, MINN. (LAT 46 21 35 LONG 095 43 57)											
JUNE, 1970											
03...	186	.25	214	162	0	6	.2	332	8.2	19.0	1

DATE	SULFATE (SO4) (MG/L)	CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	NITRATE (N) (MG/L)	NITRATE (NO3) (MG/L)	DIS-SOLVED ORTHO PHOS-PHATE (PO4) (MG/L)	DIS-SOL-VED-PHOS-PHORUS (P) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	TOTAL ORTHO PHOS-PHORUS (P) (MG/L)	DIS-SOLVED BORON (B) (UG/L)	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)
04014500 - BAPTISM R NR BEAVER BAY MINN (LAT 47 20 15 LONG 091 12 00)											
APR., 1970											
29...	11	1.2	.2	.40	1.8	.05	.030	.070	.010	3	53
04024000 - ST. LOUIS RIVER AT SCANLON, MINN. (LAT 46 42 12 LONG 092 25 07)											
OCT., 1969											
06...	24	12	.3	.13	.6	.07	.040	--	--	152	175
FEB., 1970											
18...	24	10	.4	.09	.4	.14	.080	.090	.040	75	148
APR.											
16...	16	4.8	.1	.23	1.0	.17	.080	.110	.050	17	108
JULY											
14...	16	9.0	.3	.06	.3	--	--	.040	--	16	126
05030140 - OTTER TAIL RIVER NORTHWEST OF LUCE, MINN. (LAT 46 40 20 LONG 095 39 51)											
JUNE, 1970											
03...	4.5	2.1	.2	.13	.6	--	--	.050	--	26	195
05030260 - TOAD RIVER NORTH OF PERHAM, MINN. (LAT 46 38 38 LONG 095 30 33)											
JUNE, 1970											
03...	11	5.2	.2	.14	.6	--	--	.100	--	65	275
05030300 - OTTER TAIL RIVER NEAR RICHVILLE, MINN. (LAT 46 30 50 LONG 095 31 03)											
JUNE, 1970											
03...	6.2	2.4	.1	.10	.4	--	--	.040	--	23	190
05030401 - OTTER TAIL RIVER SOUTH OF AMOR, MINN. (LAT 46 21 35 LONG 095 43 57)											
JUNE, 1970											
03...	6.5	2.9	.2	.01	.0	--	--	.010	--	25	186

DATE	DIS-CHARGE (CFS)	SILICA (SIO2) (MG/L)	DIS-SOLVED ALUM-INUM (AL) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	PO-TAS-SIUM (K) (MG/L)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	ALKA-LINITY AS CACO3 (MG/L)
05033940 - PELICAN RIVER TRIBUTARY NR DETROIT LAKES, MIN (LAT 46 46 52 LONG 095 48 01)												
MAR., 1970												
30...	.60	23	433	135	233	90	37	7.2	3.2	414	0	340
05033960 - SUCKER CREEK NEAR DETROIT LAKES, MINN. (LAT 46 46 25 LONG 095 48 23)												
OCT., 1969												
09...	1.5	24	198	77	58	70	29	4.3	3.3	356	0	292
MAR., 1970												
30...	2.0	24	306	87	120	85	30	4.5	2.9	384	0	315

DATE	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	DIS-SOLVED SOLIDS (TONS PER AC-FT)	DIS-SOLVED SOLIDS (TONS PER DAY)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	SPECI-FIC COND-UCTANCE (MICRO-MHOS)	PH (UNITS)	TEMP-ERATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)
05033940 - PELICAN RIVER TRIBUTARY NR DETROIT LAKES, MIN (LAT 46 46 52 LONG 095 48 01)											
MAR., 1970											
30...	419	.68	.81	377	37	4	.2	752	8.0	.0	10
05033960 - SUCKER CREEK NEAR DETROIT LAKES, MINN. (LAT 46 46 25 LONG 095 48 23)											
OCT., 1969											
09...	322	.47	1.39	292	0	3	.1	544	7.9	8.0	14
MAR., 1970											
30...	356	.50	1.97	335	20	3	.1	590	8.0	2.0	7

DATE	SULFATE (SO4) (MG/L)	CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	NITRATE (N) (MG/L)	NITRATE (NO3) (MG/L)	DIS-SOLVED ORTHO PHOS-PHATE (PO4) (MG/L)	DIS-SOL-VED-PHOS-PHORUS (P) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	TOTAL ORTHO PHOS-PHORUS (P) (MG/L)	DIS-SOLVED BORON (B) (UG/L)	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)
05033940 - PELICAN RIVER TRIBUTARY NR DETROIT LAKES, MIN (LAT 46 46 52 LONG 095 48 01)											
MAR., 1970											
30...	46	7.2	.2	.03	.1	.22	.080	.090	.070	0	498
05033960 - SUCKER CREEK NEAR DETROIT LAKES, MINN. (LAT 46 46 25 LONG 095 48 23)											
OCT., 1969											
09...	11	4.4	.2	.06	.3	.78	.270	--	--	21	344
MAR., 1970											
30...	15	5.2	.1	.10	.5	.08	.050	.070	.030	0	364

05133500 - RAINY RIVER AT MANITOU RAPIDS, MINN. (LAT 48 38 04 LONG 093 54 47)

DATE	DIS-CHARGE (CFS)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	ALKA-LINITY AS CACO3 (MG/L)	SULFATE (SO4) (MG/L)	CHLO-RIDE (CL) (MG/L)	NITRITE (N) (MG/L)	NITRITE (NO2) (MG/L)	AMMONIA NITRO-GEN (N) (MG/L)	NITRATE (N) (MG/L)
OCT., 1969										
15...	19000	55	0	45	8.2	1.7	.00	.01	.03	.40
NOV.										
18...	13800	57	0	47	9.0	3.6	.00	.02	.00	.10
DEC.										
16...	15520	62	0	51	6.2	4.0	.00	.00	.02	.10
16...	15520	--	--	--	--	--	--	--	--	--
JAN., 1970										
20...	12000	52	0	43	2.3	2.6	.00	.06	.01	.10
FEB.										
18...	11000	38	0	31	6.7	3.6	.00	.01	.00	.10
MAR.										
17...	11300	49	0	40	53	2.0	.00	.01	.01	.10
17...	11300	--	--	--	--	--	--	--	--	--
APR.										
21...	18200	56	0	46	13	2.0	.00	.04	.04	.25
MAY										
13...	28800	53	0	43	6.8	3.4	.00	.00	.01	.13
13...	28800	--	--	--	--	--	--	--	--	--
JUNE										
23...	61000	42	0	35	7.8	1.2	.00	.03	.03	.08
23...	61000	--	--	--	--	--	--	--	--	--

05133500 - RAINY RIVER AT MANITOU RAPIDS, MINN. (LAT 48 38 04 LONG 093 54 47)

DATE	NITRATE (NO3) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	DIS-SOL-VED-PHOS-PHORUS (P) (MG/L)	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	DIS-SOLVED SOLIDS (TONS PER AC-FT)	DIS-SOLVED SOLIDS (TONS PER DAY)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)
OCT., 1969									
15...	1.9	.49	.03	116	--	.16	5950	53	8
NOV.									
18...	.4	.18	.11	93	--	.13	3470	55	9
DEC.									
16...	.4	.01	.00	91	--	.12	3810	52	0
16...	--	--	--	--	--	--	--	--	--
JAN., 1970									
20...	.3	.09	.01	80	--	.11	2590	57	14
FEB.									
18...	.5	.03	.03	67	--	.09	1990	39	8
MAR.									
17...	.4	.04	.04	69	--	.09	2110	40	0
17...	--	--	--	--	--	--	--	--	--
APR.									
21...	1.1	.07	.03	102	--	.14	5010	54	8
MAY									
13...	.6	.06	.03	93	--	.13	7230	47	4
13...	--	--	--	--	--	--	--	--	--
JUNE									
23...	.3	.05	.03	76	--	.10	74100	38	4
23...	--	--	--	--	--	--	--	--	--

05133500 - RAINY RIVER AT MANITOU RAPIDS, MINN. (LAT 48 38 04 LONG 093 54 47)

DATE	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE (DEG C)	TURBIDITY (JTU)	BIOCHEMICAL OXYGEN DEMAND (MG/L)	METHYLENE BLUE ACTIVE SUBSTANCE (MG/L)
OCT., 1969						
15...	97	8.0	6.0	10	9.7	.00
NOV.						
18...	97	9.5	.0	5.0	2.2	.00
DEC.						
16...	107	8.1	.0	3.0	1.6	.01
16...	100	8.1	.0	--	--	--
JAN., 1970						
20...	97	7.1	.0	2.0	4.1	.00
FEB.						
18...	78	7.7	.0	3.0	1.8	.01
MAR.						
17...	93	8.2	1.0	5.0	1.6	.02
17...	88	9.2	.6	--	--	--
APR.						
21...	118	7.8	1.0	15	2.1	.01
MAY						
13...	97	8.0	7.0	15	1.9	.07
13...	93	11.0	6.0	--	--	--
JUNE						
23...	85	7.4	18.0	9.0	1.7	.04
23...	95	8.5	18.0	--	--	--

05133500 - RAINY RIVER AT MANITOU RAPIDS, MINN. (LAT 48 38 04 LONG 093 54 47)

DATE	SODIUM (NA) (MG/L)	SODIUM ADSORPTION RATIO	PERCENT SODIUM	POTASSIUM (K) (MG/L)	DISSOLVED FLUORIDE (F) (MG/L)	COLOR (PLATINUM-COBALT UNITS)	DISSOLVED ARSENIC (AS) (UG/L)	DISSOLVED BARIUM (BA) (UG/L)	DISSOLVED BERYLLIUM (BE) (UG/L)	DISSOLVED BORON (B) (UG/L)	DISSOLVED CADMIUM (CD) (UG/L)	DISSOLVED CHROMIUM (CR) (UG/L)
OCT., 1969												
15...	1.4	.1	5	1.0	.2	160	17	0	--	113	0	--
APR., 1970												
21...	1.6	.1	6	1.4	.3	130	8	0	0	87	0	--
JUNE												
23...	1.7	.1	9	.7	.2	75	0	0	0	63	0	0

05133500 - RAINY RIVER AT MANITOU RAPIDS, MINN. (LAT 48 38 04 LONG 093 54 47)

DATE	DISSOLVED COBALT (CO) (UG/L)	DISSOLVED COPPER (CU) (UG/L)	DISSOLVED IRON (FE) (UG/L)	DISSOLVED LEAD (PB) (UG/L)	DISSOLVED MANGANESE (MN) (UG/L)	DISSOLVED MOLYBDENUM (MO) (UG/L)	DISSOLVED NICKEL (NI) (UG/L)	DISSOLVED SILVER (AG) (UG/L)	DISSOLVED STRONTIUM (SR) (UG/L)	DISSOLVED VANADIUM (V) (UG/L)	DISSOLVED ZINC (ZN) (UG/L)
OCT., 1969											
15...	0	37	341	0	4	7	4	0	154	2	16
APR., 1970											
21...	0	13	205	0	41	7	0	0	222	2	0
JUNE											
23...	0	18	168	0	18	12	0	0	140	0	14

DATE	DIS-CHARGE (CFS)	SILICA (SIO2) (MG/L)	DIS-SOLVED ALUM-INUM (AL) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	PO-TAS-SIUM (K) (MG/L)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	ALKA-LINITY AS CACO3 (MG/L)
05244350 - LEAF RIVER NEAR WADENA, MINN. (LAT 46 28 09 LONG 095 10 33)												
JUNE, 1970												
04...	182	17	350	54	52	72	22	5.0	3.2	324	0	266
05244355 - LEAF RIVER TRIBUTARY NEAR WADENA, MINN. (LAT 46 28 13 LONG 095 05 40)												
JUNE, 1970												
04...	13	16	248	21	92	78	20	13	2.6	319	0	261
05244370 - WING RIVER NEAR HEWITT, MINN. (LAT 46 21 16 LONG 095 05 35)												
JUNE, 1970												
04...	43	15	301	19	47	72	22	4.5	2.8	322	0	264
05244400 - WING RIVER BELOWVERNDALE, MINN. (LAT 46 26 28 LONG 095 00 02)												
JUNE, 1970												
04...	60	16	450	37	35	67	21	4.5	2.7	297	0	244
05244420 - REDEYE RIVER NEAR ALDRICH, MINN. (LAT 46 29 58 LONG 094 54 30)												
JUNE, 1970												
04...	121	12	439	90	27	63	17	5.1	2.5	280	0	230

DATE	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	DIS-SOLVED SOLIDS (TONS PER AC-FT)	DIS-SOLVED SOLIDS (TONS PER DAY)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	SPECI-FIC COND-UCTANCE (MICRO-MHOS)	PH (UNITS)	TEMP-ERATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)
05244350 - LEAF RIVER NEAR WADENA, MINN. (LAT 46 28 09 LONG 095 10 33)											
JUNE, 1970											
04...	294	.43	154	270	4	4	.1	492	8.2	17.0	43
05244355 - LEAF RIVER TRIBUTARY NEAR WADENA, MINN. (LAT 46 28 13 LONG 095 05 40)											
JUNE, 1970											
04...	324	.45	11.6	277	15	9	.3	538	8.2	16.0	15
05244370 - WING RIVER NEAR HEWITT, MINN. (LAT 46 21 16 LONG 095 05 35)											
JUNE, 1970											
04...	290	.39	33.3	268	4	3	.1	495	8.2	18.0	15
05244400 - WING RIVER BELOW VERNDALE, MINN. (LAT 46 26 28 LONG 095 00 02)											
JUNE, 1970											
04...	279	.39	47.2	255	11	4	.1	468	8.4	17.0	20
05244420 - REDEYE RIVER NEAR ALDRICH, MINN. (LAT 46 29 58 LONG 094 54 30)											
JUNE, 1970											
04...	247	.37	88.5	226	0	5	.1	416	8.3	19.0	28

DATE	SULFATE (SO4) (MG/L)	CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	NITRATE (N) (MG/L)	NITRATE (NO3) MG/L)	DIS-SOLVED ORTHO PHOS-PHATE (PO4) (MG/L)	DIS-SOL-VED-PHOS-PHORUS (P) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	TOTAL ORTHO PHOS-PHORUS (P) (MG/L)	DIS-SOLVED BORON (B) (UG/L)	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)
05244350 - LEAF RIVER NEAR WADENA, MINN. (LAT 46 28 09 LONG 095 10 33)											
JUNE, 1970 04...	11	4.0	.4	.08	.3	--	--	.070	--	63	314
05244355 - LEAF RIVER TRIBUTARY NEAR WADENA, MINN. (LAT 46 28 13 LONG 095 05 40)											
JUNE, 1970 04...	14	20	.3	.76	3.4	--	--	.620	--	40	330
05244370 - WING RIVER NEAR HEWITT, MINN. (LAT 46 21 16 LONG 095 05 35)											
JUNE, 1970 04...	12	3.3	.2	.04	.2	--	--	.040	--	34	287
05244400 -WING RIVER BELOW VERNDALE, MINN. (LAT 46 26 28 LONG 095 00 02)											
JUNE, 1970 04...	13	5.4	.2	.68	3.0	--	--	.040	--	34	290
05244420 - REDEYE RIVER NEAR ALDRICH, MINN. (LAT 46 29 58 LONG 094 54 30)											
JUNE, 1970 04...	7.0	2.4	.3	.05	.2	--	--	.070	--	45	271

DATE	DIS-CHARGE (CFS)	SILICA (SIO2) (MG/L)	DIS-SOLVED ALUM-INUM (AL) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	PO-TAS-SIUM (K) (MG/L)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	ALKA-LINITY AS CACO3 (MG/L)
05244440 - LEAF RIVER NEAR ALDRICH, MINN. (LAT 46 27 24 LONG 094 50 29)												
JUNE, 1970												
04...	509	16	451	62	32	67	20	5.1	2.8	301	0	247
05244460 - PARTRIDGE RIVER AT ALDRICH, MINN. (LAT 46 22 31 LONG 094 56 28)												
JUNE, 1970												
04...	13	11	673	79	48	87	24	14	3.5	384	0	315
05244470 - PARTRIDGE RIVER NEAR ALDRICH, MINN. (LAT 46 25 02 LONG 094 50 28)												
JUNE, 1970												
04...	19	13	585	115	38	83	22	11	3.2	352	0	288
05270130 - ASHLEY CREEK AT WESTPORT, MINN. (LAT 45 43 07 LONG 095 09 36)												
JUNE, 1970												
09...	10	11	237	42	53	42	19	4.1	2.5	220	0	180
05275000 - ELK RIVER NEAR BIG LAKE, MINN. (LAT 45 20 02 LONG 093 40 00)												
OCT., 1969												
15...	124	9.3	221	57	32	41	14	4.1	1.8	185	0	152
NOV.												
21...	142	12	383	27	42	53	16	4.2	1.5	222	0	182
MAY , 1970												
04...	715	8.3	603	204	20	33	9.7	3.8	2.6	131	0	107
05275970 - NORTH FORK CROW RIVER NEAR GEORGEVILLE, MINN. (LAT 45 29 06 LONG 094 55 37)												
JUNE, 1970												
09...	26	20	360	68	172	69	25	5.1	2.8	313	0	257

DATE	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	DIS-SOLVED SOLIDS (TONS PER AC-FT)	DIS-SOLVED SOLIDS (TONS PER DAY)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	SPECI-FIC COND-UCTANCE (MICRO-MHOS)	PH (UNITS)	TEMP-ERATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)
05244440 - LEAF RIVER NEAR ALDRICH, MINN. (LAT 46 27 24 LONG 094 50 29)											
JUNE, 1970											
04...	267	.40	400	247	0	4	.1	459	8.3	20.0	33
05244460 - PARTRIDGE RIVER AT ALDRICH, MINN. (LAT 46 22 31 LONG 094 56 28)											
JUNE, 1970											
04...	351	.53	13.9	315	0	9	.3	601	8.3	23.0	48
05244470 - PARTRIDGE RIVER NEAR ALDRICH, MINN. (LAT 46 25 02 LONG 094 50 28)											
JUNE, 1970											
04...	331	.47	17.9	297	8	7	.3	557	8.2	21.0	32
05270130 - ASHLEY CREEK AT WESTPORT, MINN. (LAT 45 43 07 LONG 095 09 36)											
JUNE, 1970											
09...	202	.28	5.73	182	2	5	.1	349	8.1	28.0	12
05275000 - ELK RIVER NEAR BIG LAKE, MINN. (LAT 45 20 02 LONG 093 40 00)											
OCT., 1969											
15...	178	.26	64.6	160	8	5	.1	316	7.6	6.0	2
NOV.											
21...	221	.31	88.6	197	15	4	.1	370	8.0	1.0	3
MAY , 1970											
04...	147	.25	349	122	15	6	.1	257	7.6	15.0	45
05275970 - NORTH FORK CROW RIVER NEAR GEORGEVILLE, MINN. (LAT 45 29 06 LONG 094 55 37)											
JUNE, 1970											
09...	308	.44	22.7	275	18	4	.1	528	8.2	25.0	30

DATE	SULFATE (SO4) (MG/L)	CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	NITRATE (N) (MG/L)	NITRATE (NO3) (MG/L)	DIS-SOLVED ORTHO PHOS-PHATE (PO4) (MG/L)	DIS-SOL-VED-PHOS-PHORUS (P) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	TOTAL ORTHO PHOS-PHORUS (P) (MG/L)	DIS-SOLVED BORON (B) (UG/L)	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)
05244440 - LEAF RIVER NEAR ALDRICH, MINN. (LAT 46 27 24 LONG 094 50 29)											
JUNE, 1970											
04...	2.3	4.6	.2	.10	.5	--	--	.040	--	37	291
05244460 - PARTRIDGE RIVER AT ALDRICH, MINN. (LAT 46 22 31 LONG 094 56 28)											
JUNE, 1970											
04...	12	9.4	.5	.08	.4	--	--	.230	--	95	389
05244470 - PARTRIDGE RIVER NEAR ALDRICH, MINN. (LAT 46 25 02 LONG 094 50 28)											
JUNE, 1970											
04...	15	8.2	.4	.26	1.2	--	--	.100	--	55	349
05270130 - ASHLEY CREEK AT WESTPORT, MINN. (LAT 45 43 07 LONG 095 09 36)											
JUNE, 1970											
09...	11	2.8	.2	.33	1.4	--	--	.070	--	74	208
05275000 - ELK RIVER NEAR BIG LAKE, MINN. (LAT 45 20 02 LONG 093 40 00)											
OCT., 1969											
15...	12	2.8	.2	.18	.8	.16	.070	--	--	16	193
NOV.											
21...	17	4.4	.1	.70	3.1	.02	.010	--	--	24	231
MAY , 1970											
04...	20	4.2	.1	.04	.2	.08	.050	.050	.030	0	181
05275970 - NORTH FORK CROW RIVER NEAR GEORGEVILLE, MINN. (LAT 45 29 06 LONG 094 55 37)											
JUNE, 1970											
09...	26	3.0	.2	.29	1.3	.14	.050	.210	.050	0	324

DATE	DIS-CHARGE (CFS)	SILICA (SIO2) (MG/L)	DIS-SOLVED ALUM-INUM (AL) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	PO-TAS-SIUM (K) (MG/L)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	ALKA-LINITY AS CACO3 (MG/L)
05276000 - NORTH FORK CROW RIVER NEAR REGAL, MINN. (LAT 45 22 55 LONG 094 47 40)												
JUNE, 1970												
09...	32	21	435	19	67	73	27	6.6	4.2	332	0	272
05280000 - CROW RIVER AT ROCKFORD, MINN. (LAT 45 05 15 LONG 093 44 00)												
APR., 1970												
14...	960	16	501	262	83	67	28	13	5.7	208	0	171
MAY												
27...	554	11	413	140	103	65	34	23	6.0	275	0	225
JULY												
29...	237	16	--	51	20	61	29	18	5.7	280	0	229
05286000 - RUM RIVER NEAR ST. FRANCIS, MINN. (LAT 45 19 40 LONG 093 22 20)												
NOV., 1969												
21...	194	11	232	129	81	48	16	5.9	1.9	215	0	176
05303280 - EAST BRANCH CHIPPEWA RIVER AT TERRACE, MINN. (LAT 45 30 34 LONG 095 19 24)												
JUNE, 1970												
09...	28	12	358	43	92	45	23	4.2	3.6	244	0	200
05352010 - CANNON RIVER AT FARIBAULT, MINN (LAT 44 18 28 LONG 093 16 22)												
AUG., 1970												
27...	18	23	--	75	37	63	20	7.1	6.0	256	0	210
05352850 - STRAIGHT RIVER AT OWATONNA, MINN (LAT 44 05 04 LONG 093 13 48)												
AUG., 1970												
27...	16	19	--	78	480	93	30	30	5.6	336	0	275

DATE	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	DIS-SOLVED SOLIDS (TONS PER AC-FT)	DIS-SOLVED SOLIDS (TONS PER DAY)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	SPECI-FIC COND-UCTANCE (MICRO-MHOS)	PH (UNITS)	TEMP-ERATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)
05276000 - NORTH FORK CROW RIVER NEAR REGAL, MINN. (LAT 45 22 55 LONG 094 47 40)											
JUNE, 1970											
09...	330	.47	29.9	292	20	5	.2	535	8.2	22.0	26
05280000 - CROW RIVER AT ROCKFORD, MINN. (LAT 45 05 15 LONG 093 44 00)											
APR., 1970											
14...	382	.60	1150	280	109	9	.4	591	7.6	7.0	20
MAY											
27...	392	.57	627	300	75	14	.6	656	7.9	14.0	20
JULY											
29...	346	.50	236	273	43	12	.5	573	7.8	26.0	12
05286000 - RUM RIVER NEAR ST. FRANCIS, MINN. (LAT 45 19 40 LONG 093 22 20)											
NOV., 1969											
21...	208	.28	109	184	8	6	.2	357	8.1	.0	5
05303280 - EAST BRANCH CHIPPEWA RIVER AT TERRACE, MINN. (LAT 45 30 34 LONG 095 19 24)											
JUNE, 1970											
09...	231	.33	18.5	206	5	4	.1	406	8.2	25.0	20
05352010 - CANNON RIVER AT FARIBAULT, MINN (LAT 44 18 28 LONG 093 16 22)											
AUG., 1970											
27...	296	.42	15.1	238	28	6	.2	476	7.8	23.0	6
05352850 - STRAIGHT RIVER AT OWATONNA, MINN (LAT 44 05 04 LONG 093 13 48)											
AUG., 1970											
27...	481	.67	21.1	354	79	15	.7	765	7.7	26.0	6

DATE	SULFATE (SO4) (MG/L)	CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	NITRATE (N) (MG/L)	NITRATE (NO3) (MG/L)	DIS-SOLVED ORTHO PHOS-PHATE (PO4) (MG/L)	DIS-SOL-VED-PHOS-PHORUS (P) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	TOTAL ORTHO PHOS-PHORUS (P) (MG/L)	DIS-SOLVED BORON (B) (UG/L)	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)
05276000 - NORTH FORK CROW RIVER NEAR REGAL, MINN. (LAT 45 22 55 LONG 094 47 40)											
JUNE, 1970											
09...	28	4.8	.4	.50	2.2	--	--	.170	--	49	344
05280000 - CROW RIVER AT ROCKFORD, MINN. (LAT 45 05 15 LONG 093 44 00)											
APR., 1970											
14...	110	21	.0	4.1	18	.14	.330	.380	.040	21	444
MAY											
27...	90	23	.2	.85	3.8	.78	.280	.310	.260	17	419
JULY											
29...	55	21	.0	.58	2.6	--	--	.080	--	61	369
05286000 - RUM RIVER NEAR ST. FRANCIS, MINN. (LAT 45 19 40 LONG 093 22 20)											
NOV., 1969											
21...	12	6.8	.2	.02	.1	.10	.030	--	--	26	209
05303280 - EAST BRANCH CHIPPEWA RIVER AT TERRACE, MINN. (LAT 45 30 34 LONG 095 19 24)											
JUNE, 1970											
09...	20	3.0	.1	.02	.1	.20	.090	.130	.060	0	245
05352010 - CANNON RIVER AT FARIBAULT, MINN (LAT 44 18 28 LONG 093 16 22)											
AUG., 1970											
27...	35	11	.2	.91	4.0	--	--	.320	--	85	311
05352850 - STRAIGHT RIVER AT OWATONNA, MINN (LAT 44 05 04 LONG 093 13 48)											
AUG., 1970											
27...	85	44	.4	1.8	7.8	--	--	.440	--	573	489

DATE	DIS-CHARGE (CFS)	SILICA (SIO2) (MG/L)	DIS-SOLVED ALUM-INUM (AL) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	PO-TAS-SIUM (K) (MG/L)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	ALKA-LINITY AS CACO3 (MG/L)
05352900 - MAPLE CREEK AT OWATONNA, MINN (LAT 44 05 42 LONG 093 13 24)												
AUG., 1970 27...	2.0	19	--	58	200	57	28	12	3.2	296	0	242
05353600 - CRANE CREEK NEAR CLINTON FALLS, MINN (LAT 44 08 49 LONG 093 15 22)												
AUG., 1970 27...	4.7	22	--	358	200	103	29	45	4.5	296	0	242
STRAIGHT RIVER AT FARIBAULT, MINN (LAT 44 18 37 LONG 093 16 09)												
AUG., 1970 27...	47	19	--	99	91	90	30	57	8.6	3 2	0	280
CANNON RIVER AT WATERFORD, MINN (LAT 44 29 17 LONG 093 07 42)												
AUG., 1970 26...	116	19	--	69	140	83	28	28	6.1	324	0	266
05355040 - CHUB CREEK AT RANDOLPH, MINN (LAT 44 31 25 LONG 093 01 48)												
AUG., 1970 26...	6.6	17	--	99	92	77	29	5.2	2.6	315	0	258
05355140 - LITTLE CANNON RIVER NEAR CANNON FALLS, MINN (LAT 44 28 24 LONG 092 55 53)												
AUG., 1970 25...	12	11	--	84	62	67	28	4.0	2.5	295	0	242
05374000 - ZUMBRO RIVER AT ZUMBRO FALLS, MINN. (LAT 44 17 12 LONG 092 25 56)												
MAY , 1970 28...	6670	7.7	338	91	30	39	10	5.0	2.7	146	0	119

DATE	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	DIS-SOLVED SOLIDS (TONS PER AC-FT)	DIS-SOLVED SOLIDS (TONS PER DAY)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	SPECI-FIC COND-UCTANCE (MICRO-MHOS)	PH (UNITS)	TEMP-ERATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)
05352900 - MAPLE CREEK AT OWATONNA, MINN (LAT 44 05 42 LONG 093 13 24)											
AUG., 1970 27...	310	.42	1.68	258	16	9	.3	512	7.9	23.0	4
05353600 - CRANE CREEK NEAR CLINTON FALLS, MINN (LAT 44 08 49 LONG 093 15 22)											
AUG., 1970 27...	542	.84	7.88	376	134	20	1.0	906	8.0	25.0	6
STRAIGHT RIVER AT FARIBAULT, MINN (LAT 44 18 37 LONG 093 16 09)											
AUG., 1970 27...	552	.76	70.8	349	69	26	1.3	868	7.7	21.0	5
CANNON RIVER AT WATERFORD, MINN (LAT 44 29 17 LONG 093 07 42)											
AUG., 1970 26...	422	.59	135	320	54	16	.7	691	7.9	--	4
05355040 - CHUB CREEK AT RANDOLPH, MINN (LAT 44 31 25 LONG 093 01 48)											
AUG., 1970 26...	365	.52	6.81	312	54	3	.1	581	8.0	--	5
05355140 - LITTLE CANNON RIVER NEAR CANNON FALLS, MINN (LAT 44 28 24 LONG 092 55 53)											
AUG., 1970 25...	311	.43	10.1	281	40	3	.1	521	7.4	20.0	1
05374000 - ZUMBRO RIVER AT ZUMBRO FALLS, MINN. (LAT 44 17 12 LONG 092 25 56)											
MAY , 1970 28...	172	.27	3570	138	19	7	.2	310	7.5	--	30

DATE	SULFATE (SO4) (MG/L)	CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	NITRATE (N) (MG/L)	NITRATE (NO3) (MG/L)	DIS-SOLVED ORTHO PHOS-PHATE (PO4) (MG/L)	DIS-SOL-VED-PHOS-PHORUS (P) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	TOTAL ORTHO PHOS-PHORUS (P) (MG/L)	DIS-SOLVED BORON (B) (UG/L)	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)
05352900 - MAPLE CREEK AT OWATONNA, MINN (LAT 44 05 42 LONG 093 13 24)											
AUG., 1970 27...	30	14	.4	.00	.0	--	--	.110	--	78	312
05353600 - CRANE CREEK NEAR CLINTON FALLS, MINN (LAT 44 08 49 LONG 093 15 22)											
AUG., 1970 27...	72	98	.2	5.3	24	--	--	.040	--	34	621
STRAIGHT RIVER AT FARIBAULT, MINN (LAT 44 18 37 LONG 093 16 09)											
AUG., 1970 27...	82	75	.5	4.9	22	--	--	1.6	--	113	558
CANNON RIVER AT WATERFORD, MINN (LAT 44 29 17 LONG 093 07 42)											
AUG., 1970 26...	55	37	.2	1.6	6.9	--	--	.500	--	87	432
05355040 - CHUB CREEK AT RANDOLPH, MINN (LAT 44 31 25 LONG 093 01 48)											
AUG., 1970 26...	54	8.6	.0	3.8	17	--	--	.060	--	47	382
05355140 - LITTLE CANNON RIVER NEAR CANNON FALLS, MINN (LAT 44 28 24 LONG 092 55 53)											
AUG., 1970 25...	44	5.0	.2	.84	3.7	--	--	.010	--	73	313
05374000 - ZUMBRO RIVER AT ZUMBRO FALLS, MINN. (LAT 44 17 12 LONG 092 25 56)											
MAY , 1970 28...	21	5.2	.1	2.0	8.9	.88	.330	2.5	.290	0	198

DATE	DIS-CHARGE (CFS)	SILICA (SIO2) (MG/L)	DIS-SOLVED ALUM-INUM (AL) (UG/L)	DIS-SOLVED IRON (FE) (UG/L)	DIS-SOLVED MAN-GANESE (MN) (UG/L)	DIS-SOLVED CAL-CIUM (CA) (MG/L)	DIS-SOLVED MAG-NE-SIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	PO-TAS-SIUM (K) (MG/L)	BICAR-BONATE (HCO3) (MG/L)	CAR-BONATE (CO3) (MG/L)	ALKA-LINITY AS CACO3 (MG/L)
05378500 - MISSISSIPPI RIVER AT WINONA, MINN. (LAT 44 03 20 LONG 091 38 15)												
OCT., 1969												
02...	11900	4.5	306	46	0	38	17	11	3.4	176	0	144
MAR., 1970												
18...	18500	13	327	85	153	37	15	11	2.2	174	0	143
JULY												
23...	19100	7.6	--	60	24	47	17	8.4	2.7	170	0	139
05385000 - ROOT RIVER NEAR HOUSTON, MINN (LAT 43 46 05 LONG 091 35 11)												
SEP., 1970												
24...	400	8.4	--	75	37	61	23	4.0	1.9	276	0	227

DATE	DIS-SOLVED SOLIDS (SUM OF CONSTI-TUENTS) (MG/L)	DIS-SOLVED SOLIDS (TONS PER AC-FT)	DIS-SOLVED SOLIDS (TONS PER DAY)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	PERCENT SODIUM	SODIUM AD-SORP-TION RATIO	SPECI-FIC COND-UCTANCE (MICRO-MHOS)	PH (UNITS)	TEMP-ERATURE (DEG C)	COLOR (PLAT-INUM-COBALT UNITS)
05378500 - MISSISSIPPI RIVER AT WINONA, MINN. (LAT 44 03 20 LONG 091 38 15)											
OCT., 1969											
02...	205	.32	7580	163	19	12	.4	370	7.5	16.0	18
MAR., 1970											
18...	201	.30	10900	153	10	14	.4	350	8.1	3.0	17
JULY											
23...	229	.36	13600	188	49	9	.3	389	7.6	24.0	17
05385000 - ROOT RIVER NEAR HOUSTON, MINN (LAT 43 46 05 LONG 091 35 11)											
SEP., 1970											
24...	261	.37	291	245	18	3	.1	458	7.8	--	4

DATE	SULFATE (SO4) (MG/L)	CHLO-RIDE (CL) (MG/L)	DIS-SOLVED FLUO-RIDE (F) (MG/L)	NITRATE (N) (MG/L)	NITRATE (NO3) (MG/L)	DIS-SOLVED ORTHO PHOS-PHATE (PO4) (MG/L)	DIS-SOL-VED-PHOS-PHORUS (P) (MG/L)	TOTAL PHOS-PHORUS (P) (MG/L)	TOTAL ORTHO PHOS-PHORUS (P) (MG/L)	DIS-SOLVED BORON (B) (UG/L)	DIS-SOLVED SOLIDS (RESI-DUE AT 180 C) (MG/L)
05378500 - MISSISSIPPI RIVER AT WINONA, MINN. (LAT 44 03 20 LONG 091 38 15)											
OCT., 1969											
02...	34	8.6	.3	.25	1.1	.20	.100	--	--	63	236
MAR., 1970											
18...	22	11	.1	.75	3.3	.53	.190	.270	.170	0	219
JULY											
23...	51	7.8	.0	.76	3.4	--	--	.040	--	16	264
05385000 - ROOT RIVER NEAR HOUSTON, MINN (LAT 43 46 05 LONG 091 35 11)											
SEP., 1970											
24...	18	6.0	.1	.64	2.8	--	--	.090	--	4	269

05286000 RUM RIVER NEAR ST. FRANCIS, MINN.

SPECIFIC CONDUCTANCE (MICROMHOS AT 25°C), WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

	OCTOBER			NOVEMBER			DECEMBER			JANUARY		
DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	285	275	280	---	---	---	310	285	300	275	275	275
2	290	275	275	---	---	---	305	300	300	275	275	275
3	290	275	280	---	---	---	310	290	295	275	270	275
4	290	270	275	---	---	---	340	290	295	275	275	275
5	290	275	280	---	---	---	340	295	300	275	270	275
6	295	275	285	---	---	---	305	295	300	285	265	275
7	300	285	290	---	---	---	295	285	290	285	285	285
8	290	285	290	---	---	---	290	285	285	290	285	290
9	300	290	295	---	---	---	300	275	285	290	290	290
10	310	290	300	---	---	---	285	265	275	290	290	290
11	310	300	305	---	---	---	280	260	265	290	290	290
12	310	290	295	---	---	---	270	260	260	295	290	295
13	305	290	300	---	---	---	295	255	265	295	295	295
14	305	290	300	---	---	---	265	255	260	295	295	295
15	300	290	300	---	---	---	260	240	250	295	295	295
16	---	---	---	---	---	---	250	240	250	300	295	300
17	---	---	---	---	---	---	265	250	260	300	300	300
18	---	---	---	---	---	---	270	260	265	300	300	300
19	---	---	---	---	---	---	265	255	260	300	300	300
20	---	---	---	---	---	---	265	255	260	300	300	300
21	---	---	---	---	---	---	265	265	265	300	300	300
22	---	---	---	330	330	330	280	265	270	300	300	300
23	---	---	---	330	325	325	280	265	275	305	300	305
24	---	---	---	350	325	335	280	280	280	305	305	305
25	---	---	---	330	310	320	280	275	280	305	305	305
26	---	---	---	320	300	305	275	270	270	305	305	305
27	---	---	---	315	295	305	295	275	280	310	305	310
28	---	---	---	335	295	310	275	275	275	310	310	310
29	---	---	---	330	295	305	275	275	275	310	310	310
30	---	---	---	315	295	310	275	270	275	310	305	310
31	---	---	---	---	---	---	280	275	280	305	305	305
MONTH	---	---	---	---	---	---	340	240	276	310	265	295

	FEBRUARY			MARCH			APRIL			MAY		
DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	305	305	305	335	335	335	335	325	330	205	200	205
2	310	305	310	340	335	340	345	325	330	205	205	205
3	310	310	310	340	340	340	325	325	325	210	205	210
4	310	310	310	340	335	340	335	330	330	215	210	215
5	310	310	310	335	335	335	335	335	335	210	210	210
6	310	310	310	335	335	335	335	330	335	215	210	215
7	310	310	310	335	335	335	335	335	335	220	215	215
8	315	310	315	335	335	335	335	325	330	215	215	215
9	320	315	320	340	330	335	325	305	310	220	215	220
10	320	320	320	335	335	335	305	255	285	225	220	220
11	320	320	320	335	335	335	255	235	245	220	220	220
12	320	320	320	335	335	335	235	210	215	225	220	225
13	320	320	320	335	335	335	210	195	205	230	225	225
14	325	320	325	335	335	335	195	195	195	225	225	225
15	325	325	325	340	335	340	195	195	195	225	225	225
16	325	325	325	340	335	340	205	195	205	225	220	225
17	325	325	325	345	340	340	215	205	210	220	220	220
18	325	325	325	345	345	345	220	215	215	225	220	220
19	330	325	325	345	345	345	225	220	225	225	225	225
20	330	330	330	345	340	345	230	225	230	225	220	220
21	330	325	325	345	340	345	230	230	230	220	220	220
22	325	325	325	340	340	340	235	230	235	220	220	220
23	325	325	325	340	340	340	230	220	225	220	215	215
24	330	325	325	355	335	340	220	210	215	215	215	215
25	330	330	330	340	335	340	210	205	210	220	215	220
26	330	330	330	335	330	330	210	210	210	220	215	215
27	335	335	335	330	330	330	210	205	210	215	210	210
28	335	335	335	335	330	330	205	195	205	210	210	210
29	---	---	---	340	330	335	195	195	195	210	205	205
30	---	---	---	335	330	330	200	195	200	215	210	210
31	---	---	---	330	330	330	---	---	---	210	210	210
MONTH	335	305	321	355	330	337	345	195	251	230	200	216

05286000 RUM RIVER NEAR ST. FRANCIS, MINN.--Continued

SPECIFIC CONDUCTANCE (MICROMHOS AT 25°C), WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

	JUNE			JULY			AUGUST			SEPTEMBER		
DAY	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN	MAX	MIN	MEAN
1	245	210	230	230	230	230	---	---	---	---	295	295
2	245	240	245	315	230	265	---	---	---	---	295	295
3	245	245	245	260	245	250	---	---	---	---	295	300
4	245	240	240	245	245	245	---	---	---	---	300	300
5	240	235	235	245	220	235	---	---	---	---	300	300
6	235	220	225	230	230	230	---	---	---	---	295	300
7	220	220	220	235	230	230	---	---	---	---	300	300
8	225	220	225	255	230	240	---	---	---	---	300	300
9	225	225	225	260	240	245	---	---	---	300	295	300
10	235	225	225	265	245	250	---	---	---	300	295	300
11	250	240	245	250	250	250	---	---	---	300	295	295
12	250	245	250	270	250	255	---	---	---	295	295	295
13	245	245	245	255	255	255	---	---	---	295	295	295
14	245	240	240	255	250	250	---	---	---	295	290	295
15	240	235	240	280	250	265	---	---	---	290	290	290
16	240	210	225	270	250	255	---	---	---	290	290	290
17	210	200	205	275	250	260	---	---	---	295	290	290
18	205	195	200	280	245	270	---	---	---	295	295	295
19	205	195	200	295	245	275	---	---	---	295	295	295
20	205	160	185	300	250	260	---	---	---	295	295	295
21	195	185	195	260	250	255	---	---	---	295	295	295
22	220	195	205	275	260	260	---	---	---	295	295	295
23	205	200	200	280	265	270	---	---	---	295	295	295
24	215	205	205	270	270	270	---	---	---	295	295	295
25	215	205	210	270	265	270	---	---	---	295	295	295
26	210	210	210	275	260	270	---	---	---	295	295	295
27	210	210	210	---	---	---	---	---	---	305	295	300
28	230	210	220	---	---	---	---	---	---	325	300	300
29	240	210	220	---	---	---	---	---	---	305	305	305
30	230	210	225	---	---	---	---	---	---	305	305	305
31	---	---	---	---	---	---	---	---	---	---	---	---
MONTH	250	160	222	315	220	254	---	---	---	---	290	297

04014500 BAPTISM RIVER NEAR BEAVER BAY, MINN.

PERIODIC DAILY SUSPENDED SEDIMENT, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)	DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)
Dec. 16, 1969.	38	12	1.2	Apr. 28.....	2290	52	322
Jan. 19, 1970.	24	3	.19	Apr. 29.....	2170	28	164
Feb. 24.....	23	4	.25	Apr. 30.....	2090	21	118
Mar. 30.....	35	5	.47	May 1.....	1990	16	86
Apr. 9.....	200	8	4.3	May 2.....	1760	19	90
Apr. 13.....	273	23	17	May 3.....	929	46	115
Apr. 14.....	339	44	40	June 8.....	143	1	.39
Apr. 25.....	648	52	91	July 15.....	41	3	.33
Apr. 26.....	1400	62	234	Aug. 18.....	9.6	3	.08
Apr. 27.....	1850	82	410				

04018750 ST. LOUIS RIVER AT FORBES, MINN.

PERIODIC DAILY SUSPENDED SEDIMENT, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)	DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)
Oct. 2, 1969.	435	2	2.3	May 10.....	2100	30	170
Nov. 1.....	485	3	3.9	May 11.....	1920	38	197
Nov. 2.....	659	5	8.9	May 12.....	1670	82	370
Nov. 3.....	645	7	12	May 13.....	1630	66	290
Nov. 4.....	592	9	14	May 14.....	1590	36	155
Nov. 5.....	789	42	89	May 15.....	1520	57	234
Nov. 6.....	787	47	100	May 16.....	1370	20	74
Nov. 7.....	707	24	46	May 17.....	1360	17	62
Nov. 8.....	651	11	19	May 18.....	1130	21	64
Nov. 9.....	599	14	23	May 19.....	1200	17	55
Nov. 10.....	573	17	26	May 20.....	1080	19	55
Nov. 11.....	555	31	46	May 21.....	1110	25	75
Nov. 12.....	535	43	62	May 22.....	1130	12	37
Nov. 13.....	505	60	82	May 23.....	1050	20	57
Nov. 14.....	466	51	64	May 24.....	1100	12	36
Nov. 19.....	360	43	42	May 25.....	1210	17	56
Nov. 22.....	440	65	77	May 26.....	1370	20	74
Nov. 23.....	420	32	36	May 27.....	1920	15	78
Nov. 24.....	390	47	49	May 28.....	1430	23	89
Nov. 25.....	370	39	39	May 29.....	1470	40	159
Dec. 10.....	295	6	4.8	May 30.....	1660	75	336
Jan. 22, 1970.	110	17	5.0	May 31.....	1790	130	628
Feb. 20.....	102	4	1.1	June 1.....	1770	50	239
Mar. 27.....	225	6	3.6	June 2.....	1620	22	96
Apr. 9.....	700	28	53	June 3.....	1610	19	83
Apr. 10.....	920	33	82	June 4.....	1500	70	284
Apr. 11.....	950	32	82	June 5.....	1370	115	425
Apr. 12.....	960	28	73	June 6.....	1260	49	167
Apr. 13.....	987	44	117	June 7.....	1140	21	65
Apr. 14.....	988	29	77	June 8.....	876	15	35
Apr. 15.....	968	48	125	June 9.....	938	17	43
Apr. 16.....	976	58	153	June 10.....	889	55	132
Apr. 17.....	1000	22	59	June 11.....	959	32	83
Apr. 18.....	995	19	51	June 12.....	982	20	53
Apr. 19.....	975	23	61	June 13.....	962	17	44
Apr. 20.....	939	25	63	June 14.....	961	25	65
Apr. 21.....	883	20	48	June 15.....	974	33	87
Apr. 22.....	961	112	291	June 16.....	1010	14	38
Apr. 23.....	1020	46	127	June 17.....	1030	9	25
Apr. 24.....	1190	71	228	June 18.....	1020	27	74
Apr. 25.....	1500	52	211	June 19.....	979	25	66
Apr. 26.....	1690	62	283	June 20.....	922	17	42
Apr. 27.....	1910	62	320	June 21.....	864	16	37
Apr. 28.....	2230	105	632	June 22.....	750	18	36
Apr. 29.....	2370	102	653	June 23.....	697	18	34
Apr. 30.....	2470	62	413	June 24.....	685	70	129
May 1.....	2710	161	1180	June 25.....	616	78	130
May 2.....	2850	73	562	June 26.....	564	26	40
May 3.....	2880	60	467	June 27.....	519	21	29
May 4.....	2870	40	310	June 28.....	484	75	98
May 5.....	2870	70	542	June 29.....	444	62	74
May 6.....	2670	99	714	July 16.....	203	5	2.7
May 7.....	2580	40	279	Aug. 12.....	135	12	4.4
May 8.....	2300	25	155	Sept. 15.....	70	4	.8
May 9.....	2240	25	151				

05040500 PELICAN RIVER NEAR FERGUS FALLS, MINN.

INSTANTANEOUS SUSPENDED SEDIMENT, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	TIME	DISCHARGE (CFS)	CONCEN-TRATION (MG/L)	SUSPENDED SEDIMENT DISCHARGE (TONS/DAY)	DATE	TIME	DISCHARGE (CFS)	CONCEN-TRATION (MG/L)	SUSPENDED SEDIMENT DISCHARGE (TONS/DAY)
Oct. 8, 1969	1520	25.2	3.1	.21	Apr. 9.....	1205	212	94	54
Nov. 14.....	0950	12.3	53	1.8	Apr. 29.....	1225	189	16.7	8.5
Dec. 17.....	1025	16.3	9.9	.4	July 1.....	1415	127	10.2	3.5
Feb. 26, 1970	1050	30.3	14	1.2	Sept. 1.....	1450	18.5	4.1	.2
Apr. 1.....	1225	49.3	7.3	1.0					

05087500 MIDDLE RIVER AT ARGYLE, MINN.

PERIODIC DAILY SUSPENDED SEDIMENT, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)	DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)
Apr. 9, 1970.	1.4	62	.2	May 18.....	523	38	54
Apr. 10.....	2.0	60	.3	May 19.....	498	49	66
Apr. 11.....	3.0	54	.4	May 20.....	355	41	39
Apr. 12.....	4.5	39	.5	May 21.....	250	41	28
Apr. 13.....	6.0	23	.4	May 22.....	194	38	20
Apr. 14.....	35	24	2.3	May 23.....	194	34	18
Apr. 15.....	120	37	12	May 24.....	191	36	19
Apr. 16.....	210	47	27	May 25.....	181	36	18
Apr. 17.....	300	96	78	May 26.....	180	34	16
Apr. 18.....	430	52	60	May 27.....	211	34	19
Apr. 19.....	720	39	76	May 28.....	247	35	23
Apr. 20.....	770	39	81	May 29.....	261	43	30
Apr. 21.....	730	62	122	May 30.....	461	91	113
Apr. 22.....	480	92	119	May 31.....	1690	96	438
Apr. 23.....	423	121	138	June 1.....	1740	38	179
Apr. 24.....	355	158	151	June 2.....	1220	33	109
Apr. 25.....	416	240	270	June 3.....	888	30	72
Apr. 26.....	618	250	417	June 4.....	643	22	38
Apr. 27.....	991	52	139	June 5.....	462	23	29
Apr. 28.....	975	52	137	June 6.....	343	21	19
Apr. 29.....	758	81	165	June 7.....	261	19	13
Apr. 30.....	729	72	141	June 8.....	204	23	13
May 1.....	814	70	154	July 1.....	81	53	12
May 2.....	660	66	118	July 2.....	68	42	7.7
May 3.....	465	31	39	July 3.....	59	50	8.0
May 4.....	348	18	17	July 4.....	52	46	6.5
May 5.....	281	22	17	July 5.....	47	38	4.8
May 6.....	220	22	13	July 6.....	42	40	4.5
May 7.....	180	24	12	July 7.....	38	40	4.1
May 8.....	151	21	8.6	July 8.....	34	40	3.7
May 9.....	133	20	7.2	July 9.....	30	50	4.0
May 10.....	116	21	6.6	July 10.....	27	50	3.6
May 11.....	118	21	6.7	July 11.....	24	65	4.2
May 12.....	139	18	6.8	July 12.....	23	58	3.6
May 13.....	170	22	10	July 13.....	22	42	2.4
May 14.....	196	37	20	July 14.....	21	42	2.4
May 15.....	204	33	18	July 15.....	21	60	3.4
May 16.....	238	40	26	July 16.....	20	67	3.6
May 17.....	369	42	42	July 22.....	13	144	5.0

05244000 CROW WING RIVER AT NIMROD, MINN.

PERIODIC DAILY SUSPENDED SEDIMENT, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)	DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)
OCT 4, 1969..	436	4	4.7	OCT 29.....	544	3	4.4
OCT 5.....	772	8	17	OCT 30.....	538	3	4.4
OCT 6.....	798	6	13	OCT 31.....	550	4	5.9
OCT 7.....	805	5	11	NOV 1.....	568	4	6.1
OCT 8.....	798	4	8.6	NOV 2.....	556	4	6.0
OCT 9.....	805	4	8.7	NOV 3.....	538	5	7.3
OCT 10.....	818	5	11	DEC 1.....	520	2	2.8
OCT 11.....	818	6	13	JAN 26, 1970..	298	22	18
OCT 12.....	812	4	8.8	MAR 16.....	330	6	5.3
OCT 13.....	798	4	8.6	APR 8.....	770	48	100
OCT 14.....	779	5	11	APR 9.....	820	43	95
OCT 15.....	753	5	10	APR 10.....	830	30	67
OCT 16.....	720	5	9.7	APR 11.....	824	14	31
OCT 17.....	688	4	7.4	APR 12.....	818	9	20
OCT 18.....	636	4	6.9	APR 13.....	822	9	20
OCT 19.....	586	4	6.3	APR 14.....	847	8	18
OCT 20.....	562	4	6.1	APR 15.....	875	13	31
OCT 21.....	538	3	4.4	APR 16.....	898	9	22
OCT 22.....	532	3	4.3	APR 17.....	882	7	17
OCT 23.....	538	3	4.4	APR 18.....	852	12	28
OCT 24.....	538	3	4.4	APR 19.....	824	13	29
OCT 25.....	538	4	5.8	APR 20.....	793	9	19
OCT 26.....	544	4	5.9	APR 21.....	782	8	17
OCT 27.....	544	5	7.3	APR 22.....	807	11	24
OCT 28.....	538	4	5.8	APR 23.....	859	11	26

DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)	DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)
APR 24.....	999	21	57	MAY 19.....	921	16	40
APR 25.....	1190	16	51	MAY 20.....	873	14	33
APR 26.....	1230	17	56	MAY 21.....	843	13	30
APR 27.....	1250	22	74	MAY 22.....	823	11	24
APR 28.....	1430	24	93	MAY 23.....	805	11	24
APR 29.....	1480	18	72	MAY 24.....	807	19	41
APR 30.....	1490	21	84	MAY 25.....	821	13	29
MAY 1.....	1560	22	93	MAY 26.....	811	14	31
MAY 2.....	1670	22	99	MAY 27.....	774	13	27
MAY 3.....	1740	17	80	MAY 28.....	746	26	52
MAY 4.....	1730	14	65	MAY 29.....	735	13	26
MAY 5.....	1650	11	49	MAY 30.....	746	9	18
MAY 6.....	1550	12	50	MAY 31.....	756	22	45
MAY 7.....	1450	12	47	JUN 1.....	776	16	34
MAY 8.....	1380	9	34	JUN 2.....	743	25	50
MAY 9.....	1320	11	39	JUN 3.....	720	24	47
MAY 10.....	1260	10	34	JUN 4.....	698	18	34
MAY 11.....	1190	11	35	JUN 5.....	668	11	20
MAY 12.....	1140	11	34	JUN 6.....	644	22	38
MAY 13.....	1090	9	26	JUN 7.....	619	31	52
MAY 14.....	1050	9	26	JUN 8.....	587	45	71
MAY 15.....	1050	7	20	JUN 9.....	549	42	62
MAY 16.....	1030	9	25	JUN 10.....	539	22	32
MAY 17.....	991	11	29	JUN 11.....	540	12	17
MAY 18.....	952	10	26	JUN 12.....	541	8	12

DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)	DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)
JUN 13.....	576	7	11	JUN 25.....	587	24	38
JUN 14.....	600	24	39	JUN 26.....	589	9	14
JUN 15.....	655	42	74	JUN 27.....	569	19	29
JUN 16.....	707	22	42	JUN 28.....	539	41	60
JUN 17.....	701	10	19	JUN 29.....	522	36	51
JUN 18.....	686	9	17	JUN 30.....	510	14	19
JUN 19.....	676	13	24	JUL 1.....	493	15	20
JUN 20.....	669	23	42	JUL 2.....	470	36	46
JUN 21.....	648	24	42	JUL 3.....	450	33	40
JUN 22.....	628	15	25	JUL 4.....	443	19	23
JUN 23.....	612	15	25	JUL 28.....	242	11	7.2
JUN 24.....	603	24	39	AUG 31.....	251	3	2.0

05315000 REDWOOD RIVER AT MARSHALL, MINN.

PERIODIC DAILY SUSPENDED SEDIMENT, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)	DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)
Oct. 1, 1969.	6.2	150	2.5	May 17.....	31	145	12
Oct. 2.....	6.7	140	2.5	May 18.....	29	120	9.3
Oct. 3.....	6.7	116	2.0	May 19.....	25	129	8.7
Oct. 6.....	7.3	100	2.0	May 20.....	23	165	10
Oct. 7.....	7.3	97	1.9	May 21.....	22	150	8.9
Oct. 14.....	9.1	69	1.7	May 22.....	18	177	8.6
Nov. 18.....	9.5	93	2.4	May 23.....	20	150	8.1
Dec. 16.....	7.3	112	2.2	May 24.....	18	148	7.2
Jan. 21, 1970.	3.4	121	1.10	May 25.....	18	162	7.9
Mar. 25.....	24	133	8.6	May 26.....	18	140	6.8
Apr. 6.....	278	720	540	May 27.....	23	138	8.6
Apr. 7.....	206	708	394	May 28.....	28	200	15
Apr. 8.....	213	514	296	May 29.....	36	200	19
Apr. 9.....	173	365	170	June 1.....	86	260	60
Apr. 10.....	127	402	138	June 2.....	79	280	60
Apr. 11.....	99	160	43	June 3.....	73	238	47
Apr. 12.....	89	138	33	June 4.....	57	226	35
Apr. 13.....	94	92	23	June 5.....	45	240	29
Apr. 14.....	86	85	20	June 6.....	35	280	26
Apr. 15.....	96	170	44	June 7.....	28	270	20
Apr. 16.....	110	135	40	June 8.....	28	232	18
Apr. 17.....	120	141	46	June 9.....	25	262	18
Apr. 18.....	123	92	30	June 10.....	24	208	13
Apr. 19.....	141	100	38	June 11.....	26	262	18
Apr. 20.....	206	361	201	June 12.....	34	328	30
Apr. 21.....	224	115	70	June 13.....	34	168	15
Apr. 22.....	231	278	173	June 16.....	51	361	50
Apr. 23.....	231	138	86	June 17.....	63	341	58
Apr. 24.....	278	482	362	June 18.....	74	338	68
Apr. 25.....	283	482	368	June 19.....	88	331	79
May 14.....	39	140	15	July 29.....	2.9	64	.5
May 15.....	38	134	14	Aug. 26.....	2.4	93	.6
May 16.....	35	192	18				

05316500 REDWOOD RIVER NEAR REDWOOD FALLS, MINN.

PERIODIC DAILY SUSPENDED SEDIMENT, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)	DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)
Oct. 17, 1969.	22	52	3.2	May 5.....	205	230	127
Nov. 17.....	28	55	4.2	May 6.....	182	211	104
Dec. 15.....	15	151	6.1	May 7.....	164	182	81
Jan. 19, 1970.	6.9	269	5.0	May 11.....	117	287	91
Feb. 17.....	4.3	211	2.4	May 12.....	112	200	60
Mar. 23.....	54	97	14	May 13.....	105	105	30
Apr. 7.....	337	165	150	May 14.....	100	99	27
Apr. 8.....	541	667	974	May 15.....	99	106	28
Apr. 9.....	390	446	470	May 16.....	96	119	31
Apr. 10.....	325	335	294	May 17.....	92	135	33
Apr. 11.....	265	213	152	May 18.....	87	142	33
Apr. 12.....	217	145	85	May 29.....	94	155	39
Apr. 13.....	197	102	54	May 30.....	115	168	52
Apr. 14.....	205	111	61	May 31.....	190	181	93
Apr. 15.....	213	153	88	June 1.....	237	195	124
Apr. 16.....	233	175	110	June 2.....	206	201	112
Apr. 17.....	245	186	123	June 3.....	182	191	94
Apr. 18.....	241	170	111	June 4.....	157	192	81
Apr. 19.....	253	146	100	June 10.....	74	273	54
Apr. 20.....	329	232	206	June 15.....	97	181	47
Apr. 21.....	413	241	269	June 16.....	283	279	213
Apr. 22.....	450	275	334	June 17.....	515	326	453
Apr. 23.....	500	289	390	June 18.....	363	355	348
Apr. 24.....	557	292	439	July 15.....	138	200	74
Apr. 25.....	563	305	464	July 16.....	120	161	52
Apr. 26.....	568	333	511	Aug. 9.....	161	208	90
Apr. 27.....	546	331	488	Aug. 10.....	138	176	66
Apr. 28.....	475	310	398	Aug. 11.....	114	159	49
Apr. 29.....	408	313	345	Aug. 24.....	19	71	3.6
Apr. 30.....	350	317	300	Sept. 1.....	21	111	6.3
May 1.....	313	273	231	Sept. 28.....	14	92	3.5

05317000 COTTONWOOD RIVER NEAR NEW ULM, MINN.

PERIODIC DAILY SUSPENDED SEDIMENT, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)
Oct. 4, 1969.	36	73	7.1
Oct. 9.....	49	95	13
Oct. 11.....	47	130	16
Oct. 18.....	70	124	23
Oct. 25.....	67	135	24
Nov. 1.....	82	135	30
Nov. 8.....	97	84	22
Nov. 15.....	52	123	17
Nov. 19.....	27	113	8.2
Nov. 22.....	36	96	9.3
Mar. 5, 1970.	51	102	14
Mar. 7.....	90	204	50
Mar. 14.....	185	17	8.5
Mar. 21.....	170	96	44
Mar. 28.....	230	116	72
Apr. 4.....	275	246	183
Apr. 5.....	320	287	248
Apr. 6.....	530	360	515
Apr. 7.....	900	341	829
Apr. 8.....	2100	791	4480
Apr. 9.....	1900	728	3730
Apr. 10.....	1480	438	1750
Apr. 11.....	1100	405	1200
Apr. 12.....	863	276	643
Apr. 13.....	736	218	433
Apr. 14.....	688	207	384
Apr. 15.....	724	213	416
Apr. 16.....	748	206	416
Apr. 17.....	772	268	559
Apr. 18.....	740	232	464
Apr. 19.....	712	279	536
Apr. 20.....	744	277	556
Apr. 21.....	886	263	629
Apr. 22.....	1010	285	777
Apr. 23.....	1000	292	788
Apr. 24.....	962	280	727
Apr. 25.....	953	312	803
Apr. 26.....	917	336	832
Apr. 27.....	863	315	734
Apr. 28.....	788	494	1050
Apr. 29.....	684	446	824
Apr. 30.....	603	272	443
May 1.....	558	237	357
May 2.....	501	141	191
May 3.....	462	112	140
May 4.....	423	120	137
May 5.....	385	135	140
May 6.....	355	131	126
May 7.....	333	102	92
May 8.....	315	96	82
May 9.....	301	89	72
May 10.....	285	109	84
May 11.....	263	108	77
May 12.....	252	101	69
May 16.....	234	61	39
May 23.....	180	131	64
May 30.....	219	127	75
June 6.....	283	139	106
June 13.....	189	123	63
June 17.....	327	254	291
June 18.....	832	730	1640
June 19.....	1030	658	1830
June 20.....	953	518	1330
June 21.....	772	462	963
June 22.....	631	450	767
June 23.....	525	424	601
June 24.....	444	383	459
June 25.....	375	388	393
June 26.....	326	350	308
June 27.....	287	346	268
June 28.....	254	241	165
July 4.....	116	89	28
July 11.....	63	88	15
July 16.....	652	712	1250
July 18.....	420	351	398
July 19.....	328	355	314
July 20.....	265	334	239
Aug. 1.....	71	92	18
Aug. 8.....	74	90	18
Aug. 15.....	195	122	64
Aug. 20.....	100	74	20
Aug. 22.....	80	47	10
Aug. 29.....	45	61	7.4
Sept. 5.....	74	47	9.4
Sept. 12.....	50	62	8.4
Sept. 19.....	67	134	24
Sept. 25.....	67	60	11
Sept. 26.....	66	105	19

INSTANTANEOUS SUSPENDED SEDIMENT, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	TIME	DISCHARGE (CFS)	CONCEN-TRATION (MG/L)	SUSPENDED SEDIMENT DISCHARGE (TONS/DAY)
NOV 4, 1969	1150	148	1	.40
DEC 18.....	1500	166	1	.45
JAN 29, 1970	1250	97	2	.52
FEB 26.....	1030	70	2	.38
APR 1.....	1330	56	1	.15
MAY 5.....	1045	1080	2	5.8
MAY 26.....	1100	1270	3	19
JUL 24.....	1000	178	1	.48
AUG 27.....	1145	43	0	0
SEP 24.....	1015	57	4	.62

05353800 STRAIGHT RIVER NEAR FARIBAULT, MINN.

PERIODIC DAILY SUSPENDED SEDIMENT, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)
Oct. 15, 1969.	44	122	14
Nov. 21.....	43	28	3.2
Dec. 16.....	25	69	4.6
Jan. 26, 1970.	48	11	1.4
Mar. 2.....	38	9	.95
Mar. 31.....	224	113	68
Apr. 1.....	263	100	71
Apr. 2.....	294	97	77
Apr. 3.....	313	113	95
Apr. 4.....	309	91	76
Apr. 5.....	426	157	180
Apr. 6.....	663	242	433
Apr. 7.....	868	301	705
Apr. 8.....	989	265	708
Apr. 9.....	753	114	232
Apr. 10.....	539	113	164
Apr. 11.....	419	112	127
Apr. 12.....	351	118	112
Apr. 13.....	340	93	85
Apr. 14.....	396	89	95
Apr. 15.....	446	92	111
Apr. 16.....	451	110	134
Apr. 17.....	421	142	161
Apr. 18.....	366	104	103
Apr. 19.....	402	102	111
Apr. 20.....	841	314	713
Apr. 21.....	923	138	344
Apr. 22.....	833	82	184
Apr. 23.....	823	125	278
Apr. 24.....	749	92	186
Apr. 25.....	633	138	236
Apr. 26.....	527	144	205
Apr. 27.....	453	96	117
Apr. 28.....	397	80	86
Apr. 29.....	353	82	78
Apr. 30.....	332	82	74
May 1.....	361	64	62
May 2.....	377	47	48
May 3.....	349	50	47
May 4.....	309	58	48
May 5.....	277	59	44
May 6.....	249	64	43
May 7.....	230	56	35
May 8.....	216	58	34
May 9.....	209	28	16
May 14.....	717	629	1220
May 15.....	925	225	562
May 16.....	726	73	143
May 17.....	556	105	158
May 18.....	450	140	170
May 20.....	316	130	111
May 21.....	274	100	74
May 22.....	245	108	71
May 23.....	233	101	64
May 25.....	249	126	85
May 26.....	234	102	64
May 27.....	296	118	94
May 28.....	504	177	241
May 29.....	570	143	220
May 30.....	871	302	710
May 31.....	988	335	894
June 1.....	844	149	340
June 2.....	645	114	199
June 3.....	483	139	181
June 4.....	380	148	152
June 5.....	312	138	116
June 6.....	262	148	105
June 7.....	226	120	73
June 8.....	200	130	70
June 25.....	130	187	66
July 13.....	50	33	4.4
Aug. 18.....	52	61	8.6
Aug. 19.....	51	37	5.1
Sept. 21.....	89	96	23
Sept. 25.....	102	150	41
Sept. 26.....	173	122	57

05384000 ROOT RIVER NEAR LANESBORO, MINN.

PERIODIC DAILY SUSPENDED SEDIMENT, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)	DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)
MAY 28, 1970..	1120	1200	4110	JUN 15.....	711	1280	2850
MAY 29.....	1830	1170	5780	JUN 16.....	1060	2950	8870
JUN 1.....	1300	2600	9130				
JUN 2.....	830	1200	2690	JUN 17.....	725	920	1800
JUN 13.....	826	2540	5760	JUN 18.....	1400	1660	5060
JUN 14.....	491	2060	2730				

INSTANTANEOUS SUSPENDED SEDIMENT, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	TIME	DISCHARGE (CFS)	CONCEN-TRATION (MG/L)	SUSPENDED SEDIMENT DISCHARGE (TONS/DAY)	DATE	TIME	DISCHARGE (CFS)	CONCEN-TRATION (MG/L)	SUSPENDED SEDIMENT DISCHARGE (TONS/DAY)
OCT 20, 1969	1610	168	37	17	APR 29.....	1710	341	97	89
DEC 1.....	1415	146	12	4.7	JUL 7.....	1115	230	135	84
JAN 6, 1970	1700	105	49	14	AUG 10.....	1530	178	114	55
FEB 9.....	1515	128	33	11	SEP 23.....	1305	155	34	14
MAR 17.....	0920	224	68	41					

INSTANTANEOUS SUSPENDED SEDIMENT AND PARTICLE SIZE, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970
(METHODS OF ANALYSIS: B, BOTTOM WITHDRAWAL TUBE; C, CHEMICALLY DISPERSED; N, IN NATIVE WATER; P, PIPET; S, STEVE; V, VISUAL ACCUMULATION TUBE; W, IN DISTILLED WATER)

DATE	TIME	WATER TEM-PERA-TURE (°C)	DISCHARGE (CFS)	CONCEN-TRATION (MG/L)	SUSPENDED SEDIMENT DISCHARGE (TONS/DAY)	PARTICLE SIZE PERCENT FINER THAN THE SIZE (IN MILLIMETERS) INDICATED .002	.004	.008	.016	.031	.062	.125	.250	.500	1.00	2.00	METHOD OF ANALY-SIS
JUN 2, 1970	1420	17.4	830	820	1840	58	69	76	84	90	99	--	--	--	--	--	S,W,C
JUN 16.....	1100		925	3180	7940	54	62	86	90	92	99	--	--	--	--	--	S,W,C
JUN 18.....	1100		1100	4290	12700	50	62	73	91	95	99	--	--	--	--	--	S,W,C

05385000 ROOT RIVER NEAR HOUSTON, MINN.

PERIODIC DAILY SUSPENDED SEDIMENT, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)
Oct. 21, 1969.	405	56	61
Dec. 2.....	358	42	41
Jan. 7, 1970.	273	141	104
Feb. 12.....	297	21	17
Mar. 8.....	420	307	348
Mar. 17.....	470	90	114
Apr. 8.....	783	345	729
Apr. 9.....	900	420	1020
Apr. 10.....	890	405	973
Apr. 11.....	798	283	610
Apr. 23.....	916	288	712
Apr. 24.....	823	268	595
Apr. 25.....	803	250	542
Apr. 26.....	748	239	483
Apr. 30.....	612	186	307
May 15.....	798	390	840
May 16.....	1140	535	1650
May 17.....	1070	420	1210
May 18.....	926	780	2030
May 19.....	828	401	954
May 27.....	1220	3930	12500
May 28.....	1110	3690	11400
May 29.....	1660	2170	9510
May 30.....	1460	7130	27000
May 31.....	1100	4280	12700
June 1.....	1160	2890	9050
June 2.....	1280	2500	8640
June 3.....	1070	950	2740
June 4.....	937	590	1490
June 5.....	849	390	894
June 6.....	808	300	654
June 14.....	1090	3150	9270
June 15.....	849	1400	3210
June 16.....	1260	1380	4690
July 9.....	439	132	155
Aug. 11.....	388	92	96
Sept. 24.....	388	120	126

INSTANTANEOUS SUSPENDED SEDIMENT AND PARTICLE SIZE, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970
(METHODS OF ANALYSIS: B, BOTTOM WITHDRAWAL TUBE; C, CHEMICALLY DISPERSED; N, IN NATIVE WATER; P, PIPET; S, SIEVE; V, VISUAL ACCUMULATION TUBE; W, IN DISTILLED WATER)

DATE	TIME	WATER TEM-PERA-TURE (°C)	DISCHARGE (CFS)	CONCEN-TRATION (MG/L)	SUSPENDED SEDIMENT DISCHARGE (TONS/DAY)	PARTICLE SIZE PERCENT FINER THAN THE SIZE (IN MILLIMETERS) INDICATED .002	.004	.008	.016	.031	.062	.125	.250	.500	1.00	2.00	METHOD OF ANALY-SIS
June 3, 1970	1500	19	1100	688	2040	51	63	73	77	83	89	--	--	--	--	--	SPWC
June 14.....	1755	23	1090	2830	8330	60	72	85	92	96	98	--	--	--	--	--	SPWC

05476000 DES MOINES RIVER AT JACKSON, MINN.

PERIODIC DAILY SUSPENDED SEDIMENT, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DATE	MEAN DISCHARGE (CFS)	MEAN CONCEN-TRATION (MG/L)	LOAD (TONS)
Nov. 18, 1969.	20	13	.70
Dec. 16.....	44	15	1.8
Jan. 20, 1970.	20	71	3.8
Feb. 17.....	18	111	5.4
Mar. 24.....	119	88	28
Apr. 7.....	1360	444	1630
Apr. 8.....	1340	286	1030
Apr. 9.....	1280	223	771
Apr. 10.....	1390	213	799
Apr. 11.....	1400	186	703
Apr. 12.....	1330	158	567
Apr. 13.....	1270	187	621
Apr. 14.....	1190	108	347
Apr. 15.....	1150	76	236
Apr. 16.....	1140	77	237
Apr. 17.....	1120	80	242
Apr. 18.....	1050	77	218
Apr. 19.....	1040	81	227
Apr. 20.....	1160	73	229
Apr. 21.....	1220	71	234
Apr. 22.....	1200	66	214
Apr. 23.....	1160	65	204
Apr. 30.....	1040	122	343
May 1.....	966	78	203
May 2.....	914	67	165
May 3.....	848	57	131
May 4.....	775	70	146
May 5.....	692	77	144
May 6.....	616	62	103
May 7.....	560	67	101
May 8.....	528	73	104
May 9.....	471	75	95
May 10.....	418	62	70
May 11.....	387	50	52
May 12.....	373	59	59
May 13.....	390	52	55
May 14.....	421	42	48
May 15.....	409	40	44
May 16.....	398	43	46
May 17.....	353	52	50
May 18.....	334	53	48
May 19.....	302	56	46
May 20.....	271	84	61
May 21	254	72	49
May 22.....	256	67	47
May 23.....	258	59	41
May 24.....	268	52	38
May 25.....	276	47	35
May 26.....	264	48	34
May 27.....	240	40	26
June 16.....	324	164	143
June 17.....	334	126	114
June 18.....	302	102	83
June 19	264	95	68
June 20.....	249	100	67
June 21.....	256	102	70
June 22.....	258	107	75
June 23.....	256	102	70
July 14.....	367	92	91
July 15.....	636	167	287
July 16.....	587	144	228
July 17.....	401	93	101
July 18.....	589	282	448
July 19.....	528	195	278
July 20.....	457	135	167
July 21.....	337	104	95
July 22.....	274	104	77
July 23.....	240	98	64
Aug. 10.....	268	95	69
Aug. 11.....	297	90	72
Aug. 12.....	268	82	59
Aug. 24.....	80	62	13
Sept. 29.....	27	58	4.2

04014500 BAPTISM RIVER NEAR BEAVER BAY, MINN.

TEMPERATURE (°C) OF WATER, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Date	Water Temp.	Date	Water Temp.	Date	Water Temp.
Oct. 7, 1969	10	Apr. 13.....	2.5	Apr. 30.....	6
Nov. 4.....	2.5	Apr. 14.....	2.5	May 1.....	5.2
Dec. 16.....	4	Apr. 25.....	5	May 2.....	6.5
Jan. 19, 1970	3	Apr. 26.....	5	May 3.....	7
Feb. 24.....	1	Apr. 27.....	5	June 8.....	18
Mar. 30.....	1	Apr. 28.....	3	July 15.....	22
Apr. 9.....	1	Apr. 29.....	5	Aug. 18.....	17

04018750 ST. LOUIS RIVER AT FORBES, MINN.

TEMPERATURE (°C) OF WATER, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Date	Water Temp.	Date	Water Temp.	Date	Water Temp.
Oct. 2, 1969	11	Apr. 21.....	1	May 30.....	12
Nov. 1.....	3	Apr. 22.....	1	May 31.....	13
Nov. 2.....	3	Apr. 23.....	2	June 1.....	15
Nov. 3.....	3	Apr. 24.....	3	June 2.....	15
Nov. 4.....	3	Apr. 25.....	4	June 3.....	18
Nov. 5.....	4	Apr. 26.....	5	June 4.....	18
Nov. 6.....	3	Apr. 27.....	7	June 5.....	19
Nov. 7.....	3	Apr. 28.....	8	June 6.....	20
Nov. 8.....	3	Apr. 29.....	9	June 7.....	20
Nov. 9.....	4	Apr. 30.....	10	June 8.....	21
Nov. 10.....	4	May 1.....	8	June 9.....	22
Nov. 11.....	4	May 2.....	9	June 10.....	24
Nov. 12.....	3	May 3.....	9	June 11.....	22
Nov. 13.....	2	May 4.....	9	June 12.....	20
Nov. 14.....	2	May 5.....	9	June 13.....	18
Nov. 19.....	2	May 7.....	10	June 14.....	18
Nov. 20.....	0	May 9.....	10	June 15.....	18
Nov. 21.....	0	May 11.....	8	June 16.....	19
Nov. 22.....	0	May 13.....	9	June 17.....	19
Nov. 23.....	0	May 14.....	9	June 18.....	19
Nov. 24.....	1	May 15.....	9	June 19.....	19
Nov. 25.....	1	May 16.....	9	June 20.....	18
Dec. 10.....	0	May 17.....	9	June 21.....	19
Jan. 22, 1970	0	May 18.....	11	June 22.....	20
Feb. 20.....	0	May 19.....	12	June 23.....	20
Mar. 27.....	1	May 20.....	12	June 24.....	20
Apr. 11.....	1	May 21.....	12	June 25.....	19
Apr. 12.....	1	May 22.....	13	June 26.....	18
Apr. 13.....	1	May 23.....	14	June 27.....	18
Apr. 14.....	1	May 24.....	14	June 28.....	19
Apr. 15.....	2	May 25.....	11	June 29.....	21
Apr. 16.....	2	May 26.....	10	June 16.....	25
Apr. 17.....	2	May 27.....	11	Aug. 4.....	22
Apr. 18.....	2	May 28.....	11	Aug. 12.....	22.5
Apr. 19.....	1	May 29.....	12	Sept. 15.....	13
Apr. 20.....	1				

05244000 CROW WING RIVER AT NIMROD, MINN.

TEMPERATURE (°C) OF WATER, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	--	6.0	2.0	--	--	--	--	8.0	19.0	--	--	--
2	--	--	--	--	--	--	--	9.0	21.0	27.0	--	--
3	--	5.0	--	--	--	--	--	13.0	--	--	--	--
4	26.0	--	--	--	--	--	--	13.0	23.0	23.0	--	--
5	12.0	--	--	--	--	--	--	14.0	--	--	--	--
6	11.0	--	--	--	--	--	--	14.0	25.0	--	--	--
7	--	--	--	--	--	--	--	17.0	--	--	--	--
8	11.0	--	--	--	--	--	3.0	17.0	26.0	--	--	--
9	12.0	--	--	--	--	--	3.0	17.0	--	--	--	--
10	11.0	--	--	--	--	--	4.0	10.0	25.0	--	--	--
11	9.0	--	--	--	--	--	7.0	10.0	--	--	--	--
12	9.0	--	--	--	--	--	5.0	11.0	25.0	--	--	--
13	6.0	--	--	--	--	--	6.0	14.0	--	--	--	--
14	7.0	--	--	--	--	--	8.0	9.0	20.0	--	--	--
15	8.0	--	--	--	--	--	8.0	11.0	23.0	--	--	--
16	6.0	--	--	--	--	0.0	4.0	12.0	23.0	--	--	--
17	--	--	--	--	--	--	4.0	18.0	--	--	--	--
18	8.0	--	--	--	--	--	6.0	18.0	20.0	--	--	--
19	--	--	--	--	--	--	3.0	12.0	--	--	--	--
20	9.0	--	--	--	--	--	4.0	16.0	21.0	--	--	--
21	--	--	--	--	--	--	6.0	15.0	--	--	--	--
22	5.0	--	--	--	--	--	7.0	15.0	--	--	--	--
23	--	--	--	--	--	--	7.0	1[illegible].0	--	--	--	--
24	8.0	--	--	--	--	--	11.0	17.0	--	--	--	--
25	--	--	--	--	--	--	14.0	13.0	--	--	--	--
26	4.0	--	--	0.0	--	--	13.0	14.0	21.0	--	--	--
27	3.0	--	--	--	--	--	13.0	15.0	--	--	--	--
28	4.0	--	--	--	--	--	14.0	13.0	26.0	25.0	--	--
29	--	--	--	--	--	--	14.0	14.0	--	--	--	--
30	4.0	--	--	--	--	--	12.0	--	24.0	--	--	--
31	--	--	--	--	--	--	--	17.0	--	--	21.0	--
AVG	--	--	--	--	--	--	7.7	13.7	--	--	--	--

MAXIMUM VALUE =27.0 MINIMUM VALUE = 0.0

05315000 REDWOOD RIVER AT MARSHALL, MINN.

TEMPERATURE (°C) OF WATER, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Date	Water Temp.	Date	Water Temp.	Date	Water Temp.
Oct. 1, 1969	14	Apr. 19.....	5	May 28.....	17
Oct. 2.....	14	Apr. 20.....	4	May 29.....	18
Oct. 3.....	14	Apr. 21.....	3	June 1.....	19
Oct. 6.....	12	Apr. 22.....	4	June 2.....	14
Oct. 7.....	12	Apr. 23.....	1	June 3.....	15
Nov. 18.....	0	Apr. 24.....	5	June 4.....	15
Dec. 16.....	0	Apr. 25.....	8	June 5.....	18
Jan. 21, 1970	0	May 11.....	12	June 6.....	19
Mar. 25.....	0	May 12.....	11	June 7.....	20
Apr. 6.....	3	May 13.....	12	June 8.....	20
Apr. 7.....	3	May 14.....	11	June 9.....	20
Apr. 8.....	8	May 15.....	11	June 10.....	21
Apr. 9.....	6	May 16.....	9	June 11.....	20
Apr. 10.....	5	May 18.....	15	June 12.....	19
Apr. 11.....	5	May 19.....	15	June 13.....	19
Apr. 12.....	5	May 20.....	15	June 16.....	21
Apr. 13.....	3	May 21.....	16	June 17.....	21
Apr. 14.....	3	May 22.....	15	June 18.....	22
Apr. 15.....	6	May 23.....	15	June 19.....	20
Apr. 16.....	5	May 25.....	14	July 29.....	27
Apr. 17.....	5	May 26.....	14	Aug. 26.....	22
Apr. 18.....	5	May 27.....	14	Sept. 30.....	15

05316500 REDWOOD RIVER NEAR REDWOOD FALLS, MINN.

TEMPERATURE (°C) OF WATER, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Date	Water Temp.	Date	Water Temp.	Date	Water Temp.
Oct. 17, 1969	4	Apr. 17.....	6	May 18.....	21
Nov. 17.....	.5	Apr. 19.....	4	May 29.....	17
Dec. 15.....	.5	Apr. 20.....	4	June 1.....	18
Jan. 19, 1970	0	Apr. 21.....	5	June 2.....	18
Feb. 17.....	0	Apr. 22.....	3.5	June 4.....	21
Mar. 23.....	0	Apr. 23.....	4.5	June 10.....	22
Apr. 7.....	4	Apr. 25.....	9	June 15.....	24.5
Apr. 8.....	1.5	Apr. 26.....	13	June 16.....	22.0
Apr. 9.....	5.5	Apr. 27.....	17	June 18.....	20.0
Apr. 10.....	6.0	Apr. 30.....	14	July 15.....	24.0
Apr. 11.....	6.0	May 1.....	9	July 16.....	25
Apr. 12.....	4	May 5.....	16	Aug. 9.....	24.5
Apr. 13.....	3	May 6.....	16	Aug. 11.....	26
Apr. 14.....	2	May 7.....	17	Aug. 24.....	23
Apr. 15.....	6	May 11.....	14	Sept. 1.....	21
Apr. 16.....	6.5	May 13.....	21	Sept. 28.....	16

05317000 COTTONWOOD RIVER NEAR NEW ULM, MINN.

TEMPERATURE (°C) OF WATER, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Date	Water Temp.	Date	Water Temp.	Date	Water Temp.
Oct. 4, 1969	15	Apr. 9.....	4	May 16.....	10
Oct. 9.....	16	Apr. 10.....	6	May 23.....	16
Oct. 11.....	8	Apr. 11.....	6	May 30.....	16
Oct. 18.....	3	Apr. 12.....	4	June 6.....	19
Oct. 25.....	6	Apr. 13.....	4	June 13.....	20
Nov. 1.....	4	Apr. 14.....	4	June 17.....	23
Nov. 8.....	9	Apr. 15.....	4	June 18.....	21.5
Nov. 15.....	1	Apr. 16.....	4	June 19.....	21
Nov. 19.....	3	Apr. 17.....	5	June 20.....	18
Nov. 22.....	1	Apr. 18.....	5	June 21.....	17
Nov. 29.....	0	Apr. 19.....	5	June 22.....	18
Dec. 6.....	0	Apr. 20.....	4	June 23.....	19
Dec. 13.....	0	Apr. 21.....	4	June 24.....	20
Dec. 19.....	2	Apr. 22.....	4	June 25.....	20
Dec. 20.....	0	Apr. 23.....	4	June 26.....	19
Dec. 27.....	0	Apr. 24.....	6	June 27.....	18
Jan. 3, 1970	0	Apr. 25.....	7	June 28.....	19
Jan. 10.....	0	Apr. 26.....	9	July 4.....	17
Jan. 17.....	0	Apr. 27.....	16	July 11.....	22
Jan. 24.....	0	Apr. 28.....	17	July 16.....	26
Jan. 30.....	1	Apr. 29.....	19	July 25.....	21
Jan. 31.....	0	Apr. 30.....	14	Aug. 1.....	20
Feb. 7.....	0	May 1.....	11	Aug. 8.....	20
Feb. 14.....	0	May 2.....	12	Aug. 15.....	23
Feb. 21.....	0	May 3.....	12	Aug. 20.....	25
Feb. 28.....	0	May 4.....	12	Aug. 22.....	17
Mar. 5.....	2	May 5.....	12	Aug. 29.....	20
Mar. 7.....	0	May 6.....	12	Sept. 5.....	20
Mar. 14.....	0	May 7.....	14	Sept. 12.....	19
Mar. 21.....	0	May 8.....	14	Sept. 18.....	23
Mar. 28.....	0	May 9.....	15	Sept. 19.....	20
Apr. 4.....	0	May 10.....	15	Sept. 20.....	17
Apr. 6.....	1	May 11.....	13	Sept. 25.....	14
Apr. 7.....	1	May 12.....	13	Sept. 26.....	10
Apr. 8.....	3				

05353800 STRAIGHT RIVER NEAR FARIBAULT, MINN.

TEMPERATURE (°C) OF WATER, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Date	Water Temp.	Date	Water Temp.	Date	Water Temp.
Oct. 15, 1969	15	Apr. 20.....	2.5	May 19.....	10
Nov. 21.....	8	Apr. 21.....	2	May 20.....	14
Dec. 16.....	2	Apr. 22.....	4	May 21.....	16
Jan. 26, 1970	2	Apr. 23.....	6	May 22.....	15
Mar. 3.....	1	Apr. 24.....	8.5	May 23.....	14
Mar. 31.....	4.2	Apr. 25.....	12	May 25.....	11
Apr. 1.....	1	Apr. 26.....	13.5	May 26.....	10
Apr. 2.....	1	Apr. 27.....	15	May 27.....	8
Apr. 3.....	1	Apr. 28.....	16	May 28.....	10
Apr. 4.....	2	Apr. 29.....	13.5	May 29.....	11
Apr. 5.....	2	Apr. 30.....	9.5	May 30.....	12
Apr. 6.....	1.5	May 1.....	5.5	May 31.....	12
Apr. 7.....	3	May 2.....	4	June 1.....	10
Apr. 8.....	5.5	May 3.....	11	June 2.....	11
Apr. 9.....	5.5	May 4.....	12	June 3.....	10
Apr. 10.....	4.5	May 5.....	13	June 4.....	17
Apr. 11.....	6	May 6.....	8	June 5.....	13
Apr. 12.....	3.5	May 7.....	10	June 6.....	20
Apr. 13.....	2.5	May 8.....	11	June 7.....	15
Apr. 14.....	5.0	May 9.....	11	June 14.....	11
Apr. 15.....	5.5	May 14.....	6	June 25.....	21
Apr. 16.....	7	May 15.....	5	July 14.....	27
Apr. 17.....	6.5	May 16.....	8	Aug. 18.....	22.5
Apr. 18.....	5	May 17.....	7	Sept. 21.....	20.5
Apr. 19.....	3.5	May 18.....	10		

05385000 ROOT RIVER NEAR HOUSTON, MINN.

TEMPERATURE (°C) OF WATER, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Date	Water Temp.	Date	Water Temp.	Date	Water Temp.
Oct. 21, 1969	8	Apr. 24.....	12	June 1.....	18
Dec. 1.....	2.5	Apr. 25.....	13	June 2.....	18
Jan. 7, 1970	0	Apr. 26.....	18	June 3.....	18.3
Feb. 12.....	1	Apr. 30.....	18	June 4.....	20
Mar. 5.....	0	May 15.....	12	June 5.....	20
Mar. 7.....	1	May 16.....	12	June 6.....	22
Mar. 8.....	0	May 17.....	15	June 13.....	24
Mar. 17.....	6.7	May 18.....	18	June 14.....	23
Apr. 8.....	9	May 19.....	20	June 15.....	23
Apr. 9.....	10	May 26.....	18	June 17.....	24
Apr. 10.....	10	May 27.....	14	July 9.....	22
Apr. 11.....	10	May 28.....	17	Aug. 11.....	24
Apr. 21.....	8	May 29.....	17	Sept. 24.....	15
Apr. 22.....	8	May 30.....	18		
Apr. 23.....	10	May 31.....	19		

05476000 DES MOINES RIVER AT JACKSON, MINN.

TEMPERATURE (°C) OF WATER, WATER YEAR OCTOBER 1969 TO SEPTEMBER 1970

Date	Water Temp.	Date	Water Temp.	Date	Water Temp.
Nov. 18, 1969	1	May 3.....	11	June 10.....	24
Dec. 16.....	0	May 4.....	13	June 16.....	23
Jan. 20, 1970	0	May 5.....	15	June 17.....	22
Feb. 17.....	0	May 6.....	14	June 18.....	22
Mar. 24.....	1	May 7.....	15	June 19.....	20
Apr. 7.....	4	May 8.....	16	June 22.....	20
Apr. 8.....	5	May 9.....	17	June 23.....	22
Apr. 9.....	7	May 10.....	17	July 14.....	26
Apr. 10.....	7	May 11.....	17	July 15.....	23
Apr. 11.....	6	May 12.....	15	July 16.....	22
Apr. 12.....	6	May 13.....	13	July 17.....	24
Apr. 13.....	4	May 14.....	13	July 18.....	23
Apr. 14.....	5	May 15.....	12	July 19.....	23
Apr. 15.....	5	May 16.....	11	July 20.....	20
Apr. 16.....	6	May 17.....	13	July 21.....	20
Apr. 17.....	7	May 18.....	16	July 22.....	21
Apr. 18.....	7	May 19.....	19	July 23.....	23
Apr. 19.....	5	May 20.....	20	Aug. 10.....	21
Apr. 20.....	5	May 21.....	22	Aug. 11.....	23
Apr. 21.....	5	May 22.....	21	Aug. 12.....	23
Apr. 22.....	5	May 23.....	19	Aug. 24.....	24
Apr. 23.....	5	May 24.....	19	Sept. 24.....	23
Apr. 30.....	17	May 25.....	19	Sept. 29.....	14
May 1.....	13	May 26.....	17		
May 2.....	10	May 27.....	16		

LOCAL NUMBER	DATE OF SAMPLE	SILICA (SIO2) (MG/L)	DISSOLVED IRON (FE) (UG/L)	TOTAL MANGANESE (MN) (UG/L)	CALCIUM (CA) (MG/L)	MAGNESIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	POTASSIUM (K) (MG/L)	BICARBONATE (HCO3) (MG/L)	CARBONATE (CO3) (MG/L)	ALKALINITY AS CACO3 (MG/L)	SULFATE (SO4) (MG/L)
AITKIN COUNTY												
461300N0930915	07-18-68	--	510	980	66	32	8.5	1.6	383	0	314	4.0
461310N0931105	07-18-68	--	50	90	68	30	16	4.9	280	0	230	50
461257N0931513	07-18-68	--	7600	960	71	25	5.3	2.0	351	0	288	3.5
ANOKA COUNTY												
451943N0930131	08-18-69	14	20	120	28	6.0	16	1.3	155	0	127	3.3
BLUE EARTH COUNTY												
CMBR 370 440916N0940514	10-08-68	--	990	40	93	32	38	7.4	397	0	326	133
112 441445N0942001 PLSC	10-10-68	--	2300	500	123	48	58	4.3	408	0	334	287
BROWN COUNTY												
PLSC 441222N0942805	10-05-68	--	970	490	108	41	61	5.8	499	0	409	161
" 441458N0945421	10-08-68	--	1200	10	73	36	64	5.0	500	0	410	60
" 441715N0943753	10-03-68	--	330	80	85	25	7.0	1.7	315	0	258	31
" 442604N0944358	10-11-68	--	490	0	93	33	3.8	3.5	411	0	337	47
CHIPPEWA COUNTY												
" 445440N0951938	04-16-68	30	6500	140	130	75	129	6.6	427	0	350	517
CRCS 445753N0952312	04-16-68	30	4600	90	60	32	89	7.7	489	0	401	53
PLSC 445422N0953518	04-16-68	29	8700	240	155	67	26	6.6	500	0	410	306
CRCS 450051N0951828	04-16-68	30	4600	50	38	22	157	5.5	577	15	499	4.0
CRCS 450113N0952526	04-15-68	28	2300	40	61	29	179	6.6	819	0	672	4.2
450012N0952818	04-15-68	4.4	1200	40	16	6.0	141	5.7	398	0	326	.2
450038N0953107	04-15-68	31	2300	220	215	109	31	7.1	654	0	536	454
CHISAGO COUNTY												
451901N0924621	08-04-69	21	2300	340	50	31	6.4	2.4	333	0	273	2.3
452320N0924446	08-18-69	15	80	130	30	12	3.9	1.4	159	0	131	2.0
452655N0925013	08-18-69	25	140	10	79	27	3.7	2.2	373	0	306	10
452344N0925855	08-18-69	18	420	260	54	20	13	1.8	290	0	238	4.7
453004N0924454	08-15-69	25	140	10	72	27	3.5	1.6	345	0	283	7.5
454608N0925843	08-18-69	19	1200	100	61	24	12	2.7	334	0	274	1.7
453750N0925616	08-05-69	33	2400	610	69	26	5.0	1.2	333	0	273	15
454210N0930740	08-05-69	19	550	150	36	41	15	2.9	349	0	286	6.0
COTTONWOOD COUNTY												
435957N0951903	10-02-68	--	80	50	332	94	22	6.6	306	0	251	452
440530N0952114	10-02-68	--	13000	150	212	86	157	11	368	0	301	808
440720N0952609	10-04-68	--	6600	500	210	57	120	6.4	441	0	362	620
ISANTI COUNTY												
452441N0930223	08-18-69	23	100	10	42	13	3.4	.3	146	0	120	16
KANABEC COUNTY												
455239N0931748	07-16-68	--	440	450	53	16	3.3	2.0	236	0	194	6.0
454958N0932547	07-17-68	--	70	280	44	15	5.6	1.4	198	0	162	13
455430N0931120	07-05-68	--	1100	210	50	18	4.4	1.4	228	0	187	14
455510N0931420	07-05-68	--	300	190	48	24	13	1.2	298	0	244	2.8
KANDIYOHI COUNTY												
445636N0950115	04-16-68	31	1800	60	47	26	112	2.8	555	0	455	.5
445609N0950258	04-16-68	8.5	750	60	31	18	120	6.2	494	0	405	4.0
450106N0950827	04-16-68	22	2200	60	53	29	65	2.2	476	0	390	2.3
452211N0945046	02-06-68	13	--	--	60	23	2.3	1.7	219	0	180	15
452240N0950055	02-06-68	20	30	10	85	23	2.3	2.4	284	0	233	31
LINCOLN COUNTY												
441705N0960845	06-26-68	9.2	680	100	220	48	212	18	305	0	250	925
LYON COUNTY												
441631N0954327	10-12-68	--	5800	480	255	85	67	7.2	447	0	367	755
MURRAY COUNTY												
440915N0953056	10-02-68	--	21000	720	385	122	170	19	374	0	306	1440
OTTER TAIL COUNTY												
461935N0954245	09-14-68	--	20	70	50	16	1.1	2.2	218	0	178	14
462622N0951055	11-21-67	15	500	700	67	20	2.5	1.5	251	0	206	17
462656N0953222	09-18-68	--	600	130	33	16	2.5	1.6	159	0	130	17
462806N0953417	09-11-68	--	1900	280	38	20	3.1	1.8	170	0	139	28
463525N0953320	07-30-68	--	30	60	60	23	4.5	1.8	224	0	184	51
463456N0953834	09-12-68	--	0	0	28	22	1.7	1.2	147	0	120	15
463245N0953750	07-25-68	--	220	390	21	21	1.9	1.8	145	0	119	19

CHLORIDE (CL) (MG/L)	FLUORIDE (F) (MG/L)	NITRATE (NO3) (MG/L)	BORON (B) (UG/L)	DISSOLVED SOLIDS (RESIDUE AT 180 C)	DISSOLVED SOLIDS (SUM OF CONSTITUENTS)	HARDNESS (CA,MG) (MG/L)	NONCARBONATE HARDNESS (MG/L)	SODIUM ADSORPTION RATIO	SPECIFIC CONDUCTANCE (MICROMHOS)	PH	TEMPERATURE (DEG C)	COLOR
					AITKIN COUNTY							
1.0	.4	.2	30	326	--	297	0	.2	544	8.1	--	6
18	.1	34	30	399	--	290	60	.4	604	8.1	8.0	12
2.1	.2	.3	30	300	--	281	0	.1	510	8.0	12.0	18
					ANOKA COUNTY							
.7	.3	.0	40	147	147	95	0	.7	251	7.9	--	7
					BLUE EARTH COUNTY							
3.8	.4	.3	220	490	--	361	36	.9	819	8.1	--	2
1.3	.2	4.3	250	757	--	501	167	1.1	1100	7.8	--	1
					BROWN COUNTY							
1.8	.3	5.1	300	664	--	438	28	1.3	984	7.8	--	3
2.0	.5	2.6	450	478	--	328	0	1.5	814	7.8	9.0	2
8.4	.2	39	20	404	--	315	56	.1	612	7.8	--	4
2.7	.2	1.3	50	405	--	368	31	.1	667	8.2	11.0	5
					CHIPPEWA COUNTY							
4.0	.4	17	480	1190	1130	633	283	2.2	1500	7.7	10.0	10
8.8	.4	.8	580	544	528	279	0	2.3	852	7.5	9.0	32
2.8	.5	2.2	200	882	851	660	250	.4	1170	7.8	10.0	7
6.4	.6	13	970	633	585	185	0	5.0	944	7.7	8.0	90
6.0	.5	3.5	850	778	726	271	0	4.7	1140	7.7	9.0	90
32	1.1	4.7	4400	423	413	63	0	7.7	692	7.9	10.0	8
5.6	.3	23	130	1320	1200	985	448	.4	1580	7.7	8.0	5
					CHISAGO COUNTY							
1.1	.3	.2	70	278	281	253	0	.2	491	7.9	--	2
.9	.3	.0	20	140	143	123	0	.2	255	8.0	--	3
6.2	.3	.0	10	347	337	308	2	.1	553	8.0	--	5
1.4	.3	.0	20	259	257	217	0	.4	431	8.0	--	7
1.8	.2	3.1	10	308	312	291	8	.1	522	7.9	--	2
3.8	.3	.0	80	289	290	250	0	.3	499	8.0	--	2
2.8	.3	.0	10	326	319	279	6	.1	505	8.1	--	5
.8	.5	.2	100	303	294	258	0	.4	513	8.0	--	4
					COTTONWOOD COUNTY							
193	.3	361	120	2090	--	1220	966	.2	2290	7.3	--	2
6.8	.3	51	950	1680	--	883	581	2.3	1940	7.4	--	5
13	.4	7.2	550	1340	--	759	397	1.9	1640	7.7	--	5
					ISANTI COUNTY							
3.8	.2	29	10	212	203	157	37	.1	324	7.7	--	5
					KANABEC COUNTY							
5.6	.1	.2	10	232	--	195	2	.1	376	7.9	10.0	3
5.9	.1	.1	20	205	--	172	10	.2	337	8.1	9.0	1
8.0	.1	.1	10	232	--	198	10	.1	389	8.0	8.0	1
1.1	.2	.2	30	245	--	220	0	.4	430	8.2	7.0	1
					KANDIYOHI COUNTY							
4.2	.5	16	760	515	517	226	0	3.2	784	7.4	9.0	22
6.2	.7	.2	2400	438	441	149	0	4.3	723	7.8	9.0	15
5.4	.6	.9	180	422	418	251	0	1.8	692	7.7	8.0	26
7.1	.0	52	1000	289	282	243	64	.1	477	7.3	8.0	2
2.5	.0	49	20	363	356	308	74	.1	570	7.4	9.0	2
					LINCOLN COUNTY							
14	.5	.0	580	1580	1580	746	496	3.4	1990	7.6	12.0	1
					LYON COUNTY							
1.2	.2	13	410	1520	--	986	619	.9	1820	7.7	--	1
					MURRAY COUNTY							
23	.3	13	1500	2580	--	1460	1160	1.9	2710	7.4	8.3	4
					OTTER TAIL COUNTY							
1.0	.1	10	20	218	--	189	10	.0	360	8.0	9.0	3
5.1	.2	30	20	290	282	249	44	.1	431	7.9	7.0	2
2.2	.1	35	20	188	--	149	19	.1	298	8.1	9.0	1
2.6	.1	68	30	223	--	178	39	.1	347	8.0	8.0	2
9.0	.1	48	10	311	--	245	62	.1	485	7.9	9.0	1
2.4	.1	108	20	204	--	163	42	.1	321	8.0	8.0	1
2.8	.1	33	20	176	--	139	20	.1	285	8.0	8.0	2

LOCAL NUMBER	DATE OF SAMPLE	SILICA (SIO2) (MG/L)	DISSOLVED IRON (FE) (UG/L)	TOTAL MANGANESE (MN) (UG/L)	CALCIUM (CA) (MG/L)	MAGNESIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	POTASSIUM (K) (MG/L)	BICARBONATE (HCO3) (MG/L)	CARBONATE (CO3) (MG/L)	ALKALINITY AS CACO3 (MG/L)	SULFATE (SO4) (MG/L)
					PINE COUNTY							
454450N0925540	08-15-69	20	1100	60	42	22	55	3.6	361	0	296	6.5
455548N0925305	07-18-68	--	1500	0	17	5.7	3.1	.8	83	0	68	4.3
455030N0925315	07-06-68	--	50	20	44	28	17	2.5	306	0	250	5.0
455232N0925357	07-04-68	--	40	40	34	20	60	1.7	329	0	270	14
455141N0925756	07-05-68	--	840	120	58	26	5.9	2.0	327	0	268	2.5
455124N0925805	07-04-68	--	520	30	46	36	11	2.1	338	0	277	2.7
454919N0925817	10-23-68	--	1500	80	73	36	14	2.5	403	0	330	5.8
455655N0925912	07-04-68	--	1000	60	47	22	7.5	1.4	268	0	220	3.7
					PIPESTONE COUNTY							
440951N0960819	05-23-68	35	11000	450	405	138	272	13	499	0	409	1670
					POPE COUNTY							
453050N0951137	02-06-68	19	90	30	36	7.9	1.6	1.7	171	0	140	5.5
453741N0951533	02-06-68	26	90	80	128	40	36	11	354	0	290	51
454228N0951239	02-06-68	21	80	10	75	25	2.9	2.2	293	0	240	33
454024N0951922	02-06-68	22	80	0	71	22	1.9	4.8	252	0	206	48
					REDWOOD COUNTY							
441233N0950924	10-08-68	--	1100	150	113	51	134	11	373	0	306	472
441919N0952001	10-12-68	--	30	0	88	63	25	11	421	0	345	104
441802N0952646	10-12-68	--	480	20	68	20	210	8.0	202	0	166	500
442258N0950206	10-09-68	--	1200	350	171	71	44	7.8	389	0	319	505
442448N0952256	10-12-68	--	250	0	30	12	164	5.3	279	0	229	288
443008N0945759	10-08-68	--	1700	20	153	65	93	6.6	435	0	357	442
442900N0955752	10-09-68	--	200	2100	482	126	23	11	345	0	283	1280
443048N0950451	10-08-68	--	1000	130	172	62	42	11	428	0	351	396
442906N0950312	10-08-68	--	4000	1500	88	66	110	6.6	209	0	171	537
					RENVILLE COUNTY							
443134N0944733	04-18-68	23	6000	360	160	65	38	6.1	570	0	467	285
443738N0945847	04-18-68	24	7700	150	150	61	26	5.2	544	0	446	232
443857N0944045	04-19-68	26	90	320	135	53	22	7.6	514	0	421	104
444040N0944853	04-18-68	31	3300	140	118	46	13	6.1	561	0	460	65
443803N0944946	04-19-68	42	8900	420	115	65	144	7.2	913	0	749	4.5
444044N0950213	04-18-68	20	470	140	185	68	16	6.4	550	0	451	128
444358N0951153	04-17-68	14	670	40	10	4.3	263	4.5	574	0	471	26
444508N0951421	04-17-68	27	8000	100	53	41	150	3.0	648	37	593	3.0
445142N0950207	04-17-68	26	5000	100	50	32	91	3.2	539	0	442	.7
444815N0951359	04-18-68	11	2600	100	80	36	157	5.5	362	0	297	355
					STEARNS COUNTY							
452648N0945712	02-06-68	22	420	1000	85	33	6.0	19	370	0	303	101
452631N0950735	02-06-68	30	3700	250	90	28	2.9	4.1	424	0	348	2.7
453042N0950419	02-06-68	23	120	1100	98	28	5.7	35	405	0	332	33
					WASHINGTON COUNTY							
444734N0924725	08-01-69	14	110	0	38	21	2.2	.6	212	0	174	7.2
445457N0925107	08-04-69	19	60	10	60	21	3.6	.9	252	0	206	18
445521N0925603	08-01-69	22	50	10	64	25	5.0	1.3	318	0	260	14
450153N0924638	08-01-69	11	4000	130	34	13	9.2	3.7	183	0	150	1.7
450442N0924802	08-01-69	17	900	60	43	20	16	1.3	267	0	219	3.3
450358N0925560	08-01-69	27	8800	200	49	15	4.2	1.3	217	0	178	8.0
450828N0984842	08-04-69	20	20	20	44	19	2.9	1.0	213	0	175	11
451604N0924814	08-04-69	13	930	20	27	9.4	2.7	2.0	134	0	110	.5
451609N0925508	07-10-69	27	1900	280	65	26	5.0	1.6	341	0	279	1.2
					WATOWAN COUNTY							
440057N0943712	07-29-68	28	500	170	63	17	3.7	1.5	224	0	183	57
440057N0943712	07-31-68	29	530	190	65	17	3.1	1.3	225	0	184	54

CHLORIDE (CL) (MG/L)	FLUORIDE (F) (MG/L)	NITRATE (NO3) (MG/L)	BORON (B) (UG/L)	DISSOLVED SOLIDS (RESIDUE AT 180 C)	DISSOLVED SOLIDS (SUM OF CONSTITUENTS)	HARDNESS (CA,MG) (MG/L)	NONCARBONATE HARDNESS (MG/L)	SODIUM ADSORPTION RATIO	SPECIFIC CONDUCTANCE (MICROMHOS)	PH	TEMPERATURE (DEG C)	COLOR
					PINE COUNTY							
7.0	.5	.0	860	340	336	196	0	1.7	564	8.0	--	4
1.8	.0	4.0	10	109	--	67	0	.2	151	7.6	--	2
.7	.2	.2	100	256	--	222	0	.5	448	8.0	8.3	4
9.0	.1	.2	630	321	--	164	0	2.0	525	8.2	--	4
.5	.3	.1	40	273	--	249	0	.1	475	7.8	10.0	3
1.0	.3	.2	70	286	--	262	0	.3	484	8.2	--	3
8.5	.3	3.5	70	362	--	330	0	.3	614	8.1	7.0	3
1.2	.2	.3	10	238	--	208	0	.2	397	8.1	--	9
					PIPESTONE COUNTY							
17	.1	16	790	3070	2830	1580	1170	3.0	3230	7.4	7.0	7
					POPE COUNTY							
2.0	.0	2.8	20	177	162	122	0	.1	295	7.8	8.0	1
37	.1	221	14	775	724	483	192	.7	1070	7.3	8.0	2
11	.0	12	10	344	327	290	50	.1	545	7.5	9.0	1
2.8	.0	55	10	329	351	269	62	.0	513	7.4	6.0	1
					REDWOOD COUNTY							
6.6	.3	13	1500	1020	--	488	183	2.6	1400	7.9	--	2
25	.7	70	260	650	--	477	132	.5	955	7.7	--	2
30	1.0	5.5	3000	976	--	249	83	5.8	1430	7.9	10.0	2
1.2	.3	2.7	240	1050	--	719	399	.7	1390	7.6	9.0	1
29	2.8	2.0	3000	610	--	122	0	6.5	948	8.0	--	2
13	.4	11	370	1060	--	648	291	1.6	1410	7.7	10.0	4
58	.3	174	150	2580	--	1720	1440	.2	2700	7.6	--	1
10	.3	46	330	1060	--	687	336	.7	1360	7.6	--	2
3.5	.1	5.5	660	998	--	488	317	2.2	1290	8.0	--	3
					RENVILLE COUNTY							
2.0	.3	9.4	280	908	876	664	197	.6	1220	7.7	8.0	6
.8	.3	8.6	210	804	784	623	177	.5	1120	7.8	9.0	7
38	.4	55	180	721	695	555	133	.4	1080	7.8	9.0	5
1.0	.3	1.4	100	622	562	480	20	.3	877	7.8	8.0	7
73	.3	.9	440	1030	914	554	0	2.7	1720	7.9	--	75
45	.4	189	130	981	929	741	290	.3	1400	7.9	8.0	5
77	1.1	.6	1900	691	686	43	0	18	1120	8.2	8.0	7
5.8	.5	15	360	732	666	300	0	3.8	1140	8.4	8.0	60
4.4	.5	10	380	489	489	255	0	2.5	795	8.0	9.0	25
12	.6	13	960	855	853	349	52	3.7	1250	8.0	9.0	60
					STEARNS COUNTY							
13	.2	.6	30	532	464	347	43	.1	782	7.2	7.0	10
2.1	.1	.3	20	398	375	341	0	.1	628	7.1	8.0	17
7.2	.1	30	30	475	460	357	25	.1	740	7.2	9.0	4
					WASHINGTON COUNTY							
.6	.2	4.2	0	198	192	180	6	.1	342	7.9	--	6
2.4	.2	24	10	289	272	234	28	.1	446	7.7	--	3
1.6	.3	.2	10	296	290	264	3	.1	483	8.1	--	2
7.9	.2	.0	50	181	174	137	0	.3	305	7.9	--	2
1.5	.2	.0	10	233	234	190	0	.5	400	8.0	--	2
8.2	.3	.1	10	227	229	182	5	.1	362	7.6	--	9
3.8	.3	6.2	0	218	213	189	14	.1	364	8.0	--	3
1.7	.2	1.2	10	136	125	106	0	.1	220	7.7	--	4
1.3	.3	.0	20	302	298	269	0	.1	491	8.0	--	4
					WATOWAN COUNTY							
1.8	.3	.1	0	296	284	228	45	.1	448	7.8	8.0	2
.8	.2	.1	0	291	282	233	49	.1	449	7.8	9.0	1

LOCAL NUMBER	DATE OF SAMPLE	SILICA (SIO2) (MG/L)	DISSOLVED IRON (FE) (UG/L)	DISSOLVED MANGANESE (MN) (UG/L)	CALCIUM (CA) (MG/L)	MAGNESIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	POTASSIUM (K) (MG/L)	BICARBONATE (HCO3) (MG/L)	CARBONATE (CO3) (MG/L)	ALKALINITY AS CACO3 (MG/L)	SULFATE (SO4) (MG/L)
					AITKIN COUNTY							
460939N0932439	07-13-70	20	440	120	38	15	5.3	1.8	180	0	147	20
461958N0932506	07-10-70	19	190	90	31	32	9.1	3.3	269	0	221	12
461621N0933145	07-13-70	23	360	250	60	39	8.4	2.9	405	0	332	4.7
462500N0933039	07-16-70	16	70	60	24	7.9	13	2.0	146	0	120	.9
462424N0933003	07-16-70	27	1100	140	23	7.0	2.9	1.2	100	0	82	9.5
462117N0934415	07-16-70	26	20	0	34	9.3	3.3	1.3	129	0	105	10
					BENTON COUNTY							
454201N0935358	11-17-69	15	200	460	31	14	35	2.1	253	0	208	5.3
					BLUE EARTH COUNTY							
440135N0940102	11-05-69	17	2100	0	67	48	60	5.5	326	0	267	206
440402N0941050	10-31-69	27	0	0	.7	.5	220	.2	508	8	430	31
440711N0935125	11-05-69	24	3100	0	59	29	29	2.7	379	0	311	17
					COTTONWOOD COUNTY							
440456N0945521	10-29-69	22	860	0	61	22	61	2.2	361	0	296	29
					CROW WING COUNTY							
461410N0935429	07-15-70	25	600	800	22	6.1	4.4	1.0	95	0	78	9.2
461623N0940747	11-18-69	30	50	550	43	13	5.5	1.3	202	0	165	5.2
462039N0935139	07-15-70	25	880	200	44	9.3	4.8	1.7	197	0	161	1.1
					FARIBAULT COUNTY							
433425N0934000	11-04-69	25	1900	0	49	17	143	5.3	529	0	434	55
433900N0940135	11-01-69	24	7000	0	45	32	22	5.0	318	0	261	34
434255N0941330	11-06-69	28	280	0	128	50	74	6.5	332	0	272	346
434624N0935550	10-31-69	29	1800	0	81	33	22	6.8	430	0	352	30
					FREEBORN COUNTY							
433414N0933620	11-04-69	24	630	0	34	26	31	3.7	267	0	219	29
434530N0933308	11-06-69	23	10000	0	62	31	50	3.5	419	0	344	40
					JACKSON COUNTY							
434919N0945239	10-30-69	30	20	0	235	51	50	6.8	247	0	203	403
434737N0945858	10-30-69	29	110	0	330	86	16	5.2	264	0	216	478
					KANABEC COUNTY							
454433N0931036	07-19-70	39	42000	1100	46	10	2.8	2.3	189	0	155	4.6
					MILLE LACS COUNTY							
453933N0933954	07-20-70	33	4300	510	55	20	6.0	2.3	275	0	226	5.7
454518N0933929	06-17-70	24	3900	590	58	18	9.4	2.2	250	0	205	27
455536N0933916	07-21-70	18	220	70	50	31	19	3.1	340	0	278	12
460240N0933947	07-14-70	35	4900	490	52	16	4.9	1.4	243	0	199	3.9
460826N0932712	07-10-70	16	50	46	30	15	10	2.3	185	0	152	8.1
460630N0933729	07-13-70	23	1100	1600	67	36	9.8	3.0	416	0	341	2.3
460816N0934329	07-13-70	20	590	100	52	19	5.2	2.8	260	0	213	6.3
					MORRISON COUNTY							
455355N0934715	07-21-70	29	2700	1500	61	19	8.4	1.9	267	0	219	11
455405N0940624	11-17-69	17	450	110	43	17	13	1.8	244	0	200	4.0
455135N0940925	04-29-70	13	920	930	64	17	26	5.1	156	0	128	31
455055N0941730	04-28-70	15	10	0	42	11	2.8	1.3	154	0	126	22
455545N0940950	04-29-70	25	70	20	20	6.0	9.1	4.9	33	0	27	14
455445N0941425	04-29-70	17	30	30	42	8.5	17	.8	153	0	125	14
455555N0942155	04-28-70	16	10	80	55	15	5.7	5.9	162	0	133	22
455954N0935059	07-15-70	25	150	20	14	2.9	14	3.4	28	0	23	12
455905N0940505	04-29-70	15	80	410	52	16	5.8	4.4	232	0	190	19
455945N0941120	04-29-70	17	1600	180	26	11	4.3	1.0	88	0	72	16
455905N0942135	04-28-70	21	7400	1900	48	14	8.0	12	224	0	184	3.0
460500N0940505	11-18-69	20	650	50	42	20	28	2.8	310	0	254	1.5
460725N0942115	04-27-70	18	560	10	39	9.1	2.5	1.4	139	0	114	8.3
454715N0941925	04-28-70	16	820	360	39	23	6.9	3.8	219	0	180	22
454905N0942430	04-28-70	22	2600	290	66	14	4.8	8.5	274	0	225	16
460355N0942210	04-27-70	8.6	2300	270	26	7.1	3.3	2.2	128	0	105	1.7
460510N0943000	11-18-69	15	90	20	120	35	11	.8	273	0	224	25
460327N0943605	11-18-69	18	810	120	55	23	26	2.7	346	0	283	8.8
					RENVILLE COUNTY							
444122N0943834	09-28-70	28	3700	0	93	48	116	7.0	399	0	327	346
					SHERBURNE COUNTY							
451925N0933735	11-13-69	17	1200	100	35	10	2.1	1.8	165	0	135	3.3
451814N0933357	11-13-69	16	560	190	35	20	3.6	1.8	212	0	174	5.0
452637N0933543	11-14-69	23	20	20	35	8.1	2.9	.9	130	0	106	15
452640N0935953	11-14-69	21	80	40	58	19	3.9	1.7	261	0	214	16
452540N0935935	11-14-69	15	50	0	55	17	2.8	1.5	210	0	172	17

CHLORIDE (CL) (MG/L)	FLUORIDE (F) (MG/L)	NITRATE (NO3) (MG/L)	BORON (B) (UG/L)	DISSOLVED SOLIDS (RESIDUE AT 180 C)	DISSOLVED SOLIDS (SUM OF CONSTITUENTS)	HARDNESS (CA,MG) (MG/L)	NONCARBONATE HARDNESS (MG/L)	SODIUM ADSORPTION RATIO	SPECIFIC CONDUCTANCE (MICROMHOS)	PH	TEMPERATURE (DEG C)	COLOR
					AITKIN COUNTY							
4.0	.1	.0	10	201	193	157	9	.2	320	7.9	14.0	1
2.5	.2	.0	10	249	242	209	0	.3	420	8.2	9.0	1
1.6	.3	.0	40	346	339	308	0	.2	576	8.2	12.0	5
.7	.3	.1	50	140	137	92	0	.6	225	7.9	15.0	1
1.6	.1	.0	10	123	123	86	5	.1	182	8.0	13.0	5
7.5	.1	8.1	0	176	163	123	18	.1	252	7.6	13.0	2
					BENTON COUNTY							
1.6	1.2	.1	80	226	230	135	0	1.3	385	8.2	--	1
					BLUE EARTH COUNTY							
1.4	.3	12	160	589	580	364	97	1.4	853	8.0	--	5
.9	.5	.4	210	584	539	4	0	49	820	8.5	--	4
1.3	.3	4.3	140	372	357	268	0	.8	590	7.8	--	2
					COTTONWOOD COUNTY							
16	.5	19	330	430	412	243	0	1.7	658	7.8	--	10
					CROW WING COUNTY							
3.7	.0	3.3	0	130	123	80	2	.2	182	7.5	19.0	3
.4	.3	2.0	10	209	200	159	0	.2	319	8.0	--	2
1.3	.1	.0	30	192	185	148	0	.2	298	7.8	13.0	5
					FARIBAULT COUNTY							
2.2	.4	2.9	1000	560	563	192	0	4.5	877	8.1	--	3
.9	.3	.1	140	412	327	244	0	.6	609	8.1	--	2
11	.2	53	370	906	860	524	252	1.4	1200	7.8	--	2
.9	.2	2.7	190	419	419	338	0	.5	665	7.9	--	3
					FREEBORN COUNTY							
4.3	.2	1.2	170	281	285	191	0	1.0	483	8.3	--	5
1.5	.3	4.7	210	440	433	282	0	1.3	690	7.9	--	1
					JACKSON COUNTY							
110	.8	128	130	1250	1140	794	591	.8	1530	7.8	--	3
70	.4	506	90	1820	1650	1180	961	.2	2030	8.0	--	5
					KANABEC COUNTY							
3.4	.2	4.8	50	247	249	158	3	.1	320	7.9	12.0	10
					MILLE LACS COUNTY							
6.7	.3	.0	70	283	269	218	0	.2	430	7.7	12.0	5
9.4	.1	.1	80	287	276	219	14	.3	438	8.1	13.0	2
2.6	.2	.2	50	307	304	252	0	.5	579	8.3	--	3
2.1	.1	.1	20	255	240	195	0	.2	374	8.1	12.0	7
1.3	.2	.0	20	185	173	135	0	.4	307	8.1	9.0	2
1.1	.2	.0	30	348	350	315	0	.2	580	8.1	18.0	1
1.0	.1	.0	20	237	234	208	0	.2	389	8.0	18.0	1
					MORRISON COUNTY							
16	.3	.0	60	311	283	230	11	.2	526	8.0	18.0	20
.8	.4	.2	20	223	217	177	0	.4	369	8.1	--	1
35	.2	96	50	438	365	228	100	.7	577	8.0	10.0	5
3.0	.3	8.5	10	198	183	150	24	.1	298	7.9	9.0	0
6.8	.2	65	20	194	168	75	48	.5	218	7.7	7.0	0
7.2	.2	33	20	228	215	140	14	.6	334	8.1	--	0
9.4	.2	68	30	311	278	197	64	.2	437	7.9	9.0	5
13	.0	42	110	164	142	48	24	.9	187	7.7	12.0	2
3.4	.3	1.1	0	241	232	196	6	.2	386	8.2	6.0	5
3.2	.3	45	0	167	168	108	35	.2	226	8.0	9.0	0
20	.3	1.9	10	244	248	179	0	.3	397	8.3	12.0	5
.8	.3	.4	150	281	269	186	0	.9	454	8.1	--	2
2.8	.2	21	80	172	171	135	21	.1	267	7.9	9.0	5
4.0	.2	.1	10	226	225	190	10	.2	370	8.3	11.0	5
1.4	.2	.1	0	278	272	223	0	.1	441	8.1	6.0	5
1.4	.2	.1	10	132	116	94	0	.1	199	7.9	7.0	1
148	.2	9.5	10	690	499	442	218	.2	911	8.2	--	1
2.6	.3	.5	220	308	308	231	0	.7	523	8.2	--	1
					RENVILLE COUNTY							
7.2	.5	1.5	460	867	846	426	99	2.4	1160	8.1	12.0	5
					SHERBURNE COUNTY							
.6	.3	.2	0	149	153	129	0	.1	259	7.9	--	1
.6	.2	.1	20	186	187	168	0	.1	323	7.9	--	1
.2	.2	3.3	10	170	153	121	14	.1	246	7.4	--	1
1.2	.2	4.2	0	263	254	222	8	.1	430	7.7	--	1
1.8	.2	30	10	258	244	208	35	.1	403	8.1	--	1

LOCAL NUMBER	DATE OF SAMPLE	SILICA (SIO2) (MG/L)	DISSOLVED IRON (FE) (UG/L)	DISSOLVED MANGANESE (MN) (UG/L)	CALCIUM (CA) (MG/L)	MAGNESIUM (MG) (MG/L)	SODIUM (NA) (MG/L)	POTASSIUM (K) (MG/L)	BICARBONATE (HCO3) (MG/L)	CARBONATE (CO3) (MG/L)	ALKALINITY AS CACO3 (MG/L)	SULFATE (SO4) (MG/L)
					SIBLEY COUNTY							
444027N0941343	09-29-70	25	10000	0	93	46	48	6.8	448	0	368	159
443632N0940454	09-24-70	15	750	13000	93	48	40	4.1	464	0	380	144
					STEELE COUNTY							
435914N0932136	11-03-69	25	2800	0	83	28	12	2.8	385	0	316	26
					WASECA COUNTY							
435105N0934500	11-03-69	14	6700	0	26	29	110	3.4	346	0	284	141
435800N0933337	11-04-69	25	1200	0	84	34	96	3.1	528	0	433	99
440724N0933250	11-03-69	8.9	2800	0	27	27	55	6.8	353	0	290	9.5
441106N0933910	11-03-69	31	1300	0	89	41	15	5.5	475	0	389	9.2
					WATONWAN COUNTY							
435232N0944225	10-30-69	32	170	0	135	50	12	8.2	436	0	357	182
440401N0944751	10-28-69	26	1300	0	108	43	32	4.3	365	0	299	195
440218N0944849	10-29-69	30	50	0	218	98	42	5.7	309	0	253	193
					WRIGHT COUNTY							
452007N0935044	11-14-69	19	20	20	64	18	4.3	1.3	264	0	217	15

CHLO-RIDE (CL) (MG/L)	FLUO-RIDE (F) (MG/L)	NITRATE (NO3) (MG/L)	BORON (B) (UG/L)	DISS-OLVED SOLIDS (RESI-DUE AT 180 C)	DISS-OLVED SOLIDS (SUM OF CONSTI-TUENTS)	HARD-NESS (CA,MG) (MG/L)	NON-CAR-BONATE HARD-NESS (MG/L)	SODIUM AD-SORP-TION RATIO	SPECI-FIC COND-UCTANCE (MICRO-MHOS)	PH	TEMP-ERATURE (DEG C)	COLOR
					SIBLEY COUNTY							
.8	.3	2.4	390	616	611	419	51	1.0	898	8.0	1.0	1
1.6	.3	4.5	210	594	591	427	47	.8	898	7.8	11.0	6
					STEELE COUNTY							
2.0	.3	.1	70	377	371	320	5	.3	598	7.9	--	10
					WASECA COUNTY							
1.0	.1	.1	430	522	502	182	0	3.5	751	8.1	--	7
2.8	.3	2.4	230	642	608	347	0	2.2	1000	8.1	--	4
1.5	.1	.1	1700	336	314	178	0	1.8	529	8.1	--	10
15	.3	4.4	120	460	445	391	1	.3	745	7.7	--	4
					WATONWAN COUNTY							
3.9	.3	14	230	727	653	542	185	.2	959	7.7	--	3
2.9	.3	3.7	170	613	596	443	144	.7	870	7.8	--	5
264	.3	261	80	1790	1260	946	693	.6	1920	7.6	--	6
					WRIGHT COUNTY							
14	.2	4.1	10	304	271	235	18	.1	466	8.1	--	1

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